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MISSOURI BOTANICAL GARDEN BULLETIN

VOLUME X

WITH 29 PLATES

1922

ST. LOUIS, MISSOURI

PUBLISHED MONTHLY, EXCEPT JULY AND AUGUST,
BY THE BOARD OF TRUSTEES

SUBSCRIPTION PRICE:
ONE DOLLAR PER YEAR SINGLE NUMBER TEN CENTS

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Missouri Botanical Garden Bulletin

Vol. X JANUARY, 1922 No. 1

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BOARD OF TRUSTEES
OF THE MISSOURI BOTANICAL GARDEN

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ORCHID DISPLAY SHOWING TROPICAL FOREST EFFECT.

Missouri Botanical Garden Bulletin

Vol. X St. Louis, Mo., January, 1922 No. 1

THIRTY-THIRD ANNUAL REPORT OF THE DIRECTOR

Gentlemen:

I have the honor to submit herewith the thirty-third annual report of the Director.

In spite of the limitations placed upon the work by the lack of sufficient income, the Garden during the year 1921 has been able to maintain the high standard established in certain of its activities and to make some slight progress along other lines. From the standpoint of convenience to the public, the completion of the main entrance is probably the greatest single improvement. The need for the enlargement of facilities at the principal entrance to the Garden was sufficiently set forth in my previous report, and experience since the completion of the structure has more than justified the changes made. On one Sunday during the chrysanthemum show, 20,000 people were admitted to the Garden between the hours of one and five o'clock, and it would have been absolutely impossible to handle such a crowd had it not been for the perfected arrangement for entrance and exit that now exist.

The new gateway was dedicated on May 10, 1921. Mr. Edwards Whitaker, President of the Board, presided, and the Honorable Henry C. Wallace, Secretary of Agriculture, delivered the address. Luncheon was served to about 300 especially invited guests in the floral display house, and in spite of unfavorable weather the occasion was a most successful one. Secretary Wallace did not fail to point out the value of the Garden to St. Louis and perhaps unconsciously emphasized the fact which has long been known, namely, that as a place for inspiration, recreation, and study, the Missouri Botanical Garden is more greatly appreciated by those living elsewhere in the world than by the residents of Mr. Shaw's

city of adoption. Perhaps the fact that the Garden in no way appears on the tax bills of the citizens of St. Louis, as do the Art Museum, the Zoo, the Public Library, etc., may account for a certain lack of local interest.

Unfortunately the impression seems to be rather widespread that the original endowment for the Garden was quite sufficient to maintain it through an unlimited period of expansion and progress. That it costs more to maintain an institution of this kind, keeping it abreast of the changes and demands of the times, than could possibly have been foreseen by Mr. Shaw is obvious to any one who carefully considers the matter, and during the past few years, with a relatively fixed income, the effort to prevent the Garden from falling below a respectable standard has been greater than might be supposed. It should also be borne in mind that one of the chief means of support for the Garden, provided by Mr. Shaw, has never yielded anything worth mentioning. Quite apart from the fact that there has never been, on the part of the City administration or the public at large, the slightest tangible evidence of its appreciation of the Garden, the Trustees have as yet been unable to realize anything from the two-hundred-foot strip reserved by Mr. Shaw around Tower Grove Park as a definite source of income for the Garden. With taxes and the expense of keeping up the revenue-producing property of the estate gradually mounting, the sum available for the maintenance of the Garden is gradually growing less, and unless some relief is forthcoming within a comparatively short time, there will be no other alternative than to curtail in a very definite fashion some of the more attractive features now maintained. Similar institutions, particularly in this country, not only receive large appropriations from the city but likewise obtain gifts from private individuals which enable them to go forward at a pace with which the Missouri Botanical Garden cannot hope to compete. There is no good reason why public-spirited individuals in St. Louis, interested in either the scientific or popular aspects of floriculture and horticulture, should not feel constrained to add to the original endowment of Mr. Shaw. While it is true that Mr. Shaw's name is so definitely associated with the Garden that no other benefactor could hope to supersede him by a gift, no matter how large, it is likewise a fact that there are many special activities which could be specifically designated for support and with which

the name of the benefactor could be readily associated. The endowment of a special collection or garden, such as the orchids, the rose garden, or the arboretum, or for that matter the monthly flower shows, would not only make possible great expansion in these lines, but by releasing funds from income now devoted to these purposes would render a double service. Thus, it might truly be said that he who gives to the Missouri Botanical Garden gives twice.

A great need at the present time is money which could be devoted to botanical exploration. There is not now any institution in this country devoting special attention to securing new and desirable plant material from other parts of the world suitable for our indoor and outdoor floral displays. Practically every other similar institution in the country, including the United States Department of Agriculture, has for a number of years devoted large sums of money to securing economic plants, trees, and woody shrubs or herbarium material from the tropics and other parts of the world which suited their particular needs. Much of their most interesting and valuable material is obtained in this way, and the need for similar exploration along a different line has been felt for a long time at the Garden. Indeed, situated as we are, it is more important for the Missouri Botanical Garden to engage in such explorations than it is for private estates or gardens located in the vicinity of large growers of plants, where thousands of dollars are devoted each year to acquiring unusually valuable plants. A not inconsiderable source of supply of material for eastern gardens is obtained by gift from growers and owners of private estates who have surplus material or plants which they no longer desire to take care of. The only gift of this kind which the Missouri Botanical Garden has received was the notable collection of orchids contributed by the late D. S. Brown, and the tremendous value of this collection in making possible our winter orchid show is a slight indication of what we would be able to do could we but receive similar contributions from others with the same large public spirit.

To cite but one more example of the possibilities for increasing the usefulness and standing of the Missouri Botanical Garden should additional private endowments be obtained, I would call attention to the unique opportunity for establishing at the Garden a research institute for the study of plant diseases. The success of the Rockefeller Institute for

Medical Research has suggested to many botanists the desirability of having something of the same kind for the fundamental investigation of the destructive diseases which cause such tremendous losses to all engaged in the growing of plants for pleasure or for profit. While it is true that work along this line has been carried on by the United States Department of Agriculture and various state and private institutions, it is universally acknowledged that limitations of one sort and another have made it impossible for any existing organization to undertake an exhaustive and comprehensive study of the fundamental problems of plant pathology. Just as many medical schools have for years conducted a certain amount of medical research, it remained for the Rockefeller Institute, with its corps of trained experts, to advance medical research to the point of greatest efficiency. The facilities already existing at the Missouri Botanical Garden which could readily be devoted to the establishment of a research institution for plant pathology are very considerable, and it is safe to say that the initial expense as well as the future maintenance could practically be cut in half by placing such an institute at the Garden. The library and herbarium, without which no institute could hope to do satisfactory work, are already in existence, and the scientific staff, so far as it goes, is exceptionally well qualified to carry on fundamental research in plant pathology. To an unusual degree, therefore, any money given for such an institute could be applied directly to the object in view and would not have to be dissipated in accumulating a site, an administrative staff, or many of the other accessories necessary to start the work. Mr. Shaw, by his will, intended to establish a scientific institution quite as much as a garden for the enjoyment of the public. Besides starting a herbarium and library and providing for their enlargement, he specifically declared that scientific investigations in botany were to be promoted. At one time he even contemplated erecting laboratories and residences for the scientific staff opposite the main gate of the Garden, with the idea of founding a school of botany such as this country at that time had never dreamed of. One of the monuments erected by Mr. Shaw in the Garden bears the inscription: "In Honor of American Science," and another is to commemorate the victory of science over ignorance. Nothing could be more fitting than that there be established within the walls of the Garden a scientific institute

comparable to the Rockefeller Institute which would do for plants what the Rockefeller Institute has done for animals and for man.

Construction and Repair Work.—In addition to the completion of the main gate, already referred to, a considerable number of minor construction jobs have been completed and others inaugurated. The brick head-house immediately to the east of the new propagating houses was finished during the year. While the heating was being installed for this house, advantage was taken of the opportunity to connect the carpenter shed and tool house, formerly heated with stoves, with the central heating plant. The stone wall, begun several years ago, designed to screen off the service yard from the area immediately in front of the floral display house, was likewise finished. The two old gateposts on Vandeventer Avenue which marked the entrance to the Garden used by Mr. Shaw were taken down and the large stone balls, together with the accompanying cap stones, were removed to the posts of the gateway in this wall. It was desirable to preserve these stones, since they are of some historic interest, one being engraved with the name "Henry Shaw" and the other "Tower Grove." Concrete steps to replace the wooden ones leading from the pergola into the Italian Garden have been constructed. Permanent walks have been built through the arboretum, and there is now in the process of construction a concrete bridge across the creek which bounds the east and south sides of the arboretum. With the installation of a wild-flower garden back of the pergola, this region is becoming more attractive to the public and a bridge leading from this part of the Garden to the arboretum now becomes necessary. Extensive improvements in the way of clearing up and planting have been completed in the arboretum during the year and it is desirable that the public now have access to it. A concrete floor was built in the coal storage pit during the summer and additional concrete benches as well as tanks for the storage of water-lilies during the winter have been built in the various growing houses. The glass of all the conservatories and greenhouses has been reset during the past year, using a new preparation which is much more satisfactory than putty. An unusual amount of painting, both inside and outside, has likewise been taken care of.

The Weather.—The year 1921 will long be remembered at the Garden because of the unusual weather conditions and

consequent damage to plants both indoors and out. Following an unprecedentedly warm March, with all vegetation at an unusually advanced stage, a freeze in early April resulted in the destruction or setting back of some of our choicest plantations. Many of the largest and finest shrubs had to be cut back to the ground and the damage to the roses was not overcome during the season. Trees 20 and 30 years old were so badly injured by the freeze that they had to be cut down, and it will be many years before certain spots in the Garden can be brought back to their former condition. Quite as disastrous as the freeze to outdoor plants was the prolonged high temperature of the summer to the plants under glass. Certainly not since the erection of the new conservatory has the effect of the hot weather been so serious. Although the temperature has been higher for short periods in preceding years, no such duration of heat has, according to the weather reports, been equalled within the last fifty years. Whereas in previous summers the shading of the houses was not necessary more than once or twice during the season, during the summer of 1921 the shading was applied six or seven times, both on the roofs and sides of the houses. Overhead spraying and watering was resorted to whenever possible, in order to lower the temperature. In spite of every precaution, the orchids and other tropical plants burned badly. While apparently no permanent injury has resulted, it required much extra work on the part of the gardeners to prevent the loss of some of our finest specimens and the blooming of the orchids in particular was seriously affected. It is difficult for those visiting the Garden from other parts of the country to appreciate the weather conditions with which we have to contend in St. Louis in order to bring various collections to a state which will make possible favorable comparison with similar collections elsewhere. Quite apart from the extremes of heat and cold to which plants are sometimes subjected, the uncertainty of the succeeding season adds to the difficulty of definitely planning certain exhibits. The fact that within the past ten years we have had summers varying in amount of rainfall from three-quarters of an inch to forty-five inches within the same period explains why the Garden is so limited in the plants which may be used for floral displays out of doors.

Tests of plant materials from all parts of the world could formerly be made in the hope of securing new and attractive

FEDERAL VOCATIONAL TRAINING IN SCHOOL FOR GARDENING.
(PLANTING BULBS).

FEDERAL VOCATIONAL TRAINING IN SCHOOL FOR GARDENING.
(CLASSROOM)

forms capable of adapting themselves to such uneven conditions. During the past few years, however, the administration of the Quarantine Act by the Federal Horticultural Board has thrown so many obstacles in the way of importing plants that we have practically abandoned our old practice of importing large quantities of plants from abroad. It is now more necessary than ever to conserve both our greenhouse plants and those grown out of doors and much more labor and money is required for this purpose, since, if once lost, they cannot readily be replaced.

School for Gardening.—One of the activities provided for by Mr. Shaw was instruction to garden pupils, and there was early organized a school for the training of gardeners. In 1914 the amount of instruction was increased and its grade improved. Likewise, the requirements for admission to the school were raised so that more mature and better qualified students were obtained. During the war it was necessary to close the school since those eligible for admission were occupied in more important work. A few pupils returned after the armistice to complete their course, but since that time practically all the facilities of the school have been devoted to the vocational training of disabled soldiers. These men are given instruction in the various aspects of both theoretical and practical gardening and the results obtained have been extremely satisfactory. Both from the pupils themselves and their employers, it seems certain that the instruction given at the Garden has enabled these men to establish themselves in a way which might not have otherwise been possible. The vocational training of soldiers will probably be terminated some time during the coming year, and for many reasons the present time would seem to be a particularly favorable one for reorganizing the School for Gardening on a larger and more efficient basis than has heretofore been attempted. Due to the increasing interest in gardening in this part of the country and the falling off in the supply of trained men from abroad, there is a considerable demand for those capable of taking charge of private estates, managing the grounds of public institutions and parks, as well as in more specialized branches of the subject. During the past year some thirty applications for admission to the School for Gardening have been received, not only from the city of St. Louis and vicinity, but from numerous outside points. Owing to the fact that the Missouri Botanical Garden is particularly well adapted for giv-

ing both practical and theoretical training in gardening, the National Association of Gardeners is anxious to lend its support to a school of the proper kind which might be conducted here. Should it be possible to obtain the necessary financial aid, it is contemplated that the School for Gardening will be reorganized and opened for all properly qualified candidates early in the fall of 1922.

Miss Virginia McMath and Mr. Robert D. Mitchell have satisfactorily completed the three years' course and been awarded the certificate issued to graduates of the school.

Planting.—An unusual amount of attention has been paid during the past year to the planting of trees and shrubs in new localities as well as to replacing with newer and better varieties various plantations in the Garden requiring special attention. New shrubbery borders have been established on the west side of the museum building as well as along the wall near the main office. Additional planting has been done along Shaw Avenue and the banks of the creek from the boiler house to Shaw Avenue. About 2,000 trees and shrubs were used in this work, all the material being obtained from our own nursery. The gift of over 50,000 bulbs from Mr. W. A. Rowe has enabled us to provide for early spring effects in the Garden at a minimum cost. In addition to planting these bulbs in the main garden, a large number have been established in the arboretum, particularly along Shaw Avenue, and it is hoped that we may continue to receive gifts of this kind which will enable us to make this part of the Garden one of the most attractive spots.

Flower Shows.—Following the usual Christmas show of poinsettias, narcissus, etc., the large floral display house was for the first time used to display the orchids in surroundings comparable to their native habitat. Trunks of old trees were brought into the house and the orchid plants attached to them instead of being placed on stages or benches. While the effect attained was nothing like as satisfactory as the second orchid show of the year which was installed immediately after the chrysanthemum show this fall, it attracted wide attention and favorable comment. The usual display of cyclamen and cinerarias followed the orchid show, and the annual flower show of the St. Louis Garden Club was held in May. With the coöperation of certain commercial growers the show was a distinct advance over the one pre-

viously held, and from the greatly increasing interest it would appear that this display may now be regarded as a permanent feature at the Garden. During the summer the house was filled with foliage plants in variety. The chrysanthemum show which opened early in November was arranged in a slightly different manner, permitting the large crowds to be conducted straight through the house and out at the north doorway. In some respects this was the most satisfactory chrysanthemum show ever held and in the point of attendance exceeded any previous year. The show was kept in place for nearly six weeks, the longest period these plants have ever been displayed. While the weather was not particularly favorable for their preservation, the excellent condition of the foliage and the remarkably strong growth made early in the season enabled us to prolong the display into the second week in December. After the removal of the chrysanthemums the installation of the orchid show was begun. In addition to using even a greater number of tree trunks than for the previous display and draping them with Florida moss, the entire floor was covered with leaves in which terrestrial orchids and ferns were set, thus carrying out the tropical forest effect more satisfactorily. Three of the national moving-picture concerns have either taken views or arranged to do so, and, since these films are shown not only locally and throughout the United States but are likewise in the international service, the Garden and the city are receiving most effective advertising.

ATTENDANCE FOR THE YEAR 1921

The installation of registering turnstiles at the main entrance, as well as the completion of the fence around the Garden, has made it possible during the greater part of this year to keep a more accurate record of the visitors to the Garden than has ever before been possible in its history. The effect of the summer weather upon the attendance was as evident as upon the plants. The falling off in the number of visitors during July and August was particularly noticeable. This loss was more than made up by increased attendance during the spring and fall so that the total number of visitors was nearly 20,000 in excess of the previous year.

	Week-days	Sundays
January	4,278	4,858
February	5,924	5,813
March	10,432	9,543
April	8,368	7,282

May	12,988	18,448
June	7,625	6,340
July	9,236	8,635
August	12,191	10,172
September	10,486	11,414
October	8,992	9,218
November	40,322	59,534
December	5,368	4,349
	136,210	155,606
		136,210
Total		291,816

ANNUAL BEQUESTS

The Annual Flower Sermon, provided for in the will of Mr. Shaw, was preached at Christ Church Cathedral, on May 8, by Rev. John H. Lever, Rector of the Mariner's Church, of Detroit, Michigan.

The banquet of the Board of Trustees of the Garden was held at the Hotel Jefferson, on the evening of December 28, on the occasion of the meeting in St. Louis of the American Historical Association. Chancellor Frederic A. Hall presided, and the retiring president of the American Historical Association, Jules Jusserand, Ambassador of the French Republic, delivered an address on "The Rearing of Ambassadors."

The $500 bequest provided by Mr. Shaw "for premiums or prizes at a flower show or exhibit" was awarded in connection with the spring flower show of the Garden Club of St. Louis.

RESEARCH AND INSTRUCTION

In the laboratories, as also in the herbarium, research work is constantly in progress, though the volume of the endeavor in this direction is, of course, materially affected by the number and grade of the graduate students in attendance. Beginning with the opening of the academic year, 1921-22, the quota of graduate students has been larger than at any time since 1917 and fully equal to the usual pre-war enrollment. On this account, too, a maximum number of advanced courses is being offered preliminary to, or in conjunction with, the research in progress. Besides the regular members of the Garden scientific staff, research is undertaken both by other members of the corps of instruction and by the graduate students mentioned, the names of both classes appearing in the sub-joined section.

Graduates, Fellows, and Investigators.—Those taking graduate work and registered as candidates for degrees in the

Henry Shaw School of Botany of Washington University are as follows: G. M. Armstrong and R. W. Webb, formerly Rufus J. Lackland research fellows; E. B. Payson, formerly teaching fellow, Washington University; F. S. Wolpert, formerly assistant in botany, University of Montana (reappointed third year); A. F. Camp, L. J. Klotz, H. R. Rosen—all Rufus J. Lackland research fellows; Grace E. Howard, Mildred L. Johnson—Jessie R. Barr graduate fellows in Washington University; C. G. Deuber, teaching fellow in Washington University; Cora A. Mautz, instructor in botany in Principia School; also Dr. Norma E. Pfeiffer, assistant professor of botany, University of North Dakota, in special investigation.

The following are 1921-22 appointments to fellowships with indications as to the previous positions or training of the appointees:

Rufus J. Lackland Fellows.—A. F. Camp, A. B., University of California, assistant in plant pathology, University of California; L. J. Klotz, B. S., and M. S., Michigan Agricultural College; H. R. Rosen, B. S., Pennsylvania State College, M. S., University of Wisconsin, associate professor in plant pathology, University of Arkansas; F. S. Wolpert, A. B., University of Montana, reappointed third year.

Jessie R. Barr Fellows.—Mildred L. Johnson, B. S., Oregon Agricultural College, assistant in botany, University of Oregon; Grace E. Howard, A. B., and M. S., University of Washington, graduate assistant, University of Washington.

Appointments to other positions were as follows: Joanne L. Karrer, B. S., and M. S., University of Washington, Ph. D., Washington University, teaching fellow and research assistant; G. M. Armstrong, B. S., Clemson College, M. A., University of Wisconsin, Ph. D., Washington University, instructor in botany in Washington University; C. G. Deuber, B. S., University of Missouri, teaching fellow.

On June 9 at the annual commencement of Washington University the degree of Doctor of Philosophy was conferred upon the following members of the graduate laboratory: G. M. Armstrong, the title of whose thesis was "Studies in the Physiology of the Fungi. XIV. Sulphur Nutrition: The Use of Thiosulphate as Influenced by Hydrogen-Ion Concentration," E. B. Payson, with a thesis entitled "Monographic Study of *Thelypodium* and Its Immediate Allies," and R. W. Webb, whose thesis topic was "Studies in the

Physiology of the Fungi. XV. Germination of the Spores of Certain Fungi in Relation to H-Ion Concentration.''

Dr. E. B. Payson terminated his connection with the Garden and accepted an appointment as assistant professor of botany in charge of the department, at the University of Wyoming, Laramie. Dr. R. W. Webb was appointed plant pathologist in the Bureau of Plant Industry in the study of wheat diseases, with an assignment at Madison, Wisconsin.

Publications and Papers.—Throughout the year there has been delay in the publication of the ANNALS, due to the widespread strike of printers, and only two of the four numbers of volume VIII have thus far appeared, though an additional number is in press. The three numbers referred to include the following articles in the order of their occurrence:

Matsumoto, T. ''Studies in the Physiology of the Fungi. XII. Physiological Specialization in Rhizoctonia Solani Kühn.''

Karrer, Joanne L. ''Studies in the Physiology of the Fungi. XIII. The Effect of Hydrogen-Ion Concentration upon the Accumulation and Activation of Amylase Produced by Certain Fungi.''

Greenman, J. M. ''Two New Senecios from the West Indies.''

Payson, E. B. ''A Monograph of the Genus Lesquerella.''

Armstrong, G. M. ''Studies in the Physiology of the Fungi. XIV. Sulphur Nutrition: The Use of Thiosulphate as Influenced by Hydrogen-Ion Concentration.''

Webb, R. W. ''Studies in the Physiology of the Fungi. XV. Germination of the Spores of Certain Fungi in Relation to H-Ion Concentration.''

In addition to the preceding the following papers by members of the scientific or Garden staffs have appeared in other publications:

Duggar, B. M. ''Some Phases of Metabolism in the Fungi.'' Carnegie Inst. Washington, Year Book, 1921.

Duggar, B. M. ''The Relation of Carbon and Nitrogen Sources to Acid Production in Fungi.'' *Ibid*, 1921.

Jensen, L. P. ''Care in Transplanting Trees and Shrubs.'' Parks and Recreation, 1921.

Jensen, L. P. ''The Conservation of Nature.'' Parks and Recreation, 1921.

Jensen, L. P. ''Hardy Herbaceous Plants for Parks.'' Parks and Recreation, 1921.

Jensen, L. P. "Interesting Native Flowering Trees for Park Planting." Parks and Recreation, 1921.

Jensen, L. P. "Proposal for the World's Greatest Garden." Parks and Recreation, 1921.

Jensen, L. P. "Publications of Interest to Park Superintendents." Parks and Recreation, 1921.

Jensen, L. P. "The Value of Parks to Posterity." Parks and Recreation, 1921.

Pring, G. H. "Indoor Plant Collections at the Missouri Botanical Garden." Parks and Recreation, 1921.

Scientific and Popular Lectures.—During the year papers read and lectures delivered, whether popular or scientific, by those connected with the Garden are listed below:

B. M. Duggar, February 5, before the St. Louis College Club, "Some Aspects of the Japanese Problem in California."

B. M. Duggar, August 4, before the Pacific Coast section of the American Society of Naturalists in Berkeley, "Some Phases of Metabolism in the Fungi."

B. M. Duggar, August 4, before the Pacific Coast section of the American Society of Naturalists in Berkeley, "The Effects of Certain Colloids on the Salt Requirements of Seed Plants."

B. M. Duggar, December 29, before the mycological section of the Botanical Society of America and the American Phytopathological Society, Toronto, "Sizes of the Infective Particles of the Mosaic Disease of Tobacco."

B. M. Duggar, December 29, before the mycological section of the Botanical Society of America and the American Phytopathological Society, Toronto, "Notes on Some More Favorable Liquid Media for the Growth of Fungi."

B. M. Duggar, December 30, before the physiological section of the Botanical Society of America and the chemical section of the American Association for the Advancement of Science, "Composition of the Substrate in Relation to Changes in H-Ion Concentration Induced by Fungi."

L. P. Jensen, March 9, before the St. Louis Association of Gardeners, "The Principles of Landscape Gardening."

L. P. Jensen, March 16, before the St. Louis Florists' Club, "The Principles of Landscape Gardening."

L. P. Jensen, May 4, before the St. Louis Association of Gardeners, "Formal Landscape Gardening."

L. P. Jensen, May 16, before the St. Louis Academy of Science, "Conservation and Protection of Native Plants."

L. P. Jensen, August 24, at the convention of the American Association of Park Superintendents, Detroit, "The Value of Parks to Posterity."

L. P. Jensen, September 23, before the Parent-Teachers' Association of the Lockwood School, Webster Groves, "Our Native Plants: Their Conservation and Uses."

J. H. Kellogg, October 19, before the St. Louis Natural History Museum Association at the St. Louis Public Library, "Fall Flowers."

G. T. Moore, January 14, before the upper school of the St. Louis Country Day School, "Commercial Botany."

G. T. Moore, January 18, before the Garden Club of St. Louis, "The Fertility of the Soil."

G. T. Moore, March 31, before the Men's Club of St. Michael and All Angels Church, "Gardens, the Weather, and the Soil."

G. T. Moore, April 18, before the Graduate Club of Washington University, "Technical Botany."

G. T. Moore, May 5, before the Women's organization of B'nai El congregation, "Some Garden Faults and How to Correct Them."

G. T. Moore, November 26, before the biological section of the Central Association of Science and Mathematics Teachers, "Science Teaching and the Missouri Botanical Garden."

G. T. Moore, November 30, before the science section of the Wednesday Club, "The Missouri Botanical Garden and Botany," in symposium on "What Has Missouri Done for Science in Its One Hundred Years of Statehood?"

J. Noyes, February 15, before the Garden Club of St. Louis, "Garden Ornament: Its Location and Arrangement."

G. H. Pring, January 5, before the St. Louis Association of Gardeners, "The Use of Botany to the Gardener."

G. H. Pring, February 17, before the Patrons' Association of the Mason School, "Mimicry in Plants."

G. H. Pring, March 20, at the Brooklyn Botanic Garden, "The Missouri Botanical Garden."

G. H. Pring, April 6, before the St. Louis Association of Gardeners, "The International Flower Show of New York."

G. H. Pring, April 14, before the St. Louis Florists' Club, "The International Flower Show of New York."

G. H. Pring, May 12, before the Mason School Patrons' Association, "The International Flower Show of New York."

G. H. Pring, October 10, before the Garden Club of Flush-

ing, New York, "Gardening in the Western States Compared with that of the Eastern States."

G. H. Pring, October 10, before the New York Florists' Club, "Commercial Gardening in the Middle West."

G. H. Pring, October 11, before the National Association of Gardeners, "The School Garden Movement of Cleveland, Ohio."

G. H. Pring, December 13, before the St. Louis Aquarium Society, "Aquatic Plants, Including Those Adapted to Aquaria."

The present location and occupation of former graduate students and others who have undertaken investigations or assisted in the laboratory or herbarium:—

E. R. Allen, Chemist, Research Department of the E. I. DuPont de Nemours and Company, Wilmington, Delaware.

H. W. Anderson, Assistant Professor (Plant Pathology), University of Illinois, Urbana.

G. M. Armstrong, Instructor in Botany, Washington University, St. Louis.

E. G. Arzberger, Pathologist, U. S. Department of Agriculture, Washington.

W. W. Bonns, Director Botanical Research, Eli Lilly and Company, Indianapolis, Indiana.

Mary M. Bryan, Teacher, Evander Childs School, New York City.

C. O. Chambers, Professor of Botany, Oklahoma A. and M. College, Stillwater.

W. H. Chambers, Research Department, Barnard Skin and Cancer Hospital; Assistant in Experimental Surgery, Washington University School of Medicine, St. Louis.

J. S. Cooley, Pathologist, U. S. Department of Agriculture, Washington.

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HERBARIUM

The herbarium has made a remarkably well-balanced growth during the year, having acquired about the usual number of plants from various parts of North America, Mexico, Central America, and the West Indies, and notably a relatively large number of exotic plants, substantially augmenting the representation of the flora of South America, Eastern Asia, the Philippine Islands, Formosa, the Himalayas, the Gangetic Plains, Finland, etc. The growth of the herbarium, however, is not only one of geographical significance, since the collections obtained represent essentially all groups of plants.

New Accessions.—The total number of herbarium specimens received in 1921 is considerably in excess of the year immediately preceding, notwithstanding the fact that no large private herbarium was purchased during the year. Among the more noteworthy collections acquired since the last annual report are the following: from the Arnold Arboretum, 362 plants of eastern Asia, mainly Korea and Formosa, collected by E. H. Wilson; Elam Bartholomew, 200 "North American Uredinales"; Professors G. R. Bisby and A. H. R. Buller, 83 specimens of fungi from Manitoba, Canada; Bureau of Science, Manila, 892 fungi and mosses of the Philippine Islands; Dr. R. P. Burke, 97 specimens of fungi from Alabama; B. F. Bush, 237 plants of Missouri and South Carolina; Carnegie Museum, Pittsburgh, 200 plants of Pennsylvania; Ira W. Clokey, 258 plants of Colorado; Rev. John Davis, 1,014 plants of Missouri, North Carolina, and South

Carolina; Walter Deane, 96 plants, mainly from Berkshire County, Massachusetts; J. A. Drushel, 118 plants of the United States; P. Dusén, 457 specimens of plants of Brazil; D. Lewis Dutton, 160 plants of Vermont; Dr. W. H. Emig, 269 specimens of mosses from Rocky Mountain Park, Alberta; Field Museum of Natural History, 52 fungi of Santa Catalina Island, California; Friedländer & Sohn, 100 fungi of Germany; J. M. Grant, 307 plants of Washington; Gray Herbarium, Harvard University, 148 specimens, mostly plants of Nova Scotia; A. A. Heller, 170 plants of California; Dr. H. D. House, 65 fungi; C. J. Humphrey, 95 Hydnaceous fungi; L. A. Kenoyer, 715 plants of the Himalayas and the Gangetic Plains; National Herbarium, Pretoria, 51 plants of South Africa; New York Botanical Garden, 260 plants of the United States and the West Indies; Dr. E. B. Payson, 56 plants of Idaho, Wyoming, and Colorado; Ad. Tonduz, 201 plants of Guatemala; United States National Herbarium, 860 herbarium duplicates; Botanical Museum, University of Helsingfors, 1,000 plants of Finland. Many smaller collections have been received, which are duly recorded in current numbers of the BULLETIN.

Mounting and Distribution.—The mounting of herbarium material has continued throughout the year, and approximately 25,000 specimens have been mounted and incorporated in the general herbarium during the fiscal year. This number includes specimens received on current accessions and a complete series of the first set of plants from the David A. Watt Herbarium and the John H. Kellogg Herbarium. These two private herbaria have furnished several thousand duplicates which are now ready for distribution. The Kellogg Herbarium is made up primarily of plants of Missouri and Arkansas, and substantially supplements the constantly increasing representation of the flora of Missouri and the entire Ozark region. The Watt Herbarium consists mainly of ferns and fern-allies from all parts of the world, as well as several series of exceedingly rare *exsiccati* of mosses, lichens, and algae, especially of Great Britain, Central Europe, Scandinavia, and Lapland. This collection in particular forms a very valuable addition to the herbarium of the Missouri Botanical Garden.

Field Work.—No systematized field work has been carried on during the year, although a few short trips have been made and several local botanists and friends of the Garden

have generously deposited in the herbarium collections of especial interest. *In lieu* of field work the main efforts of the small herbarium staff have been concentrated on the mounting, distribution, and more complete organization of material already on hand.

Exchanges.—Through exchanges with individual botanists and institutions a number of important series of herbarium specimens have been acquired. A limited number of duplicates has been sent to correspondents during the past year; but a distribution of several thousand duplicates will be made during the coming spring season.

Use of the Herbarium by Outside Botanists.—Botanists from various parts of the country have visited the herbarium in about the same number as in 1920; and every facility possible has been extended to these specialists. Dr. Norma E. Pfeiffer again spent some time at the Garden during the early summer in continuance of her monographic study of *Isoetes*. This work has been completed and the monograph is practically ready for the printer. Incidentally it may be said that domestic and foreign correspondents have responded generously in supplying material of certain exotic and rare species of this very interesting group of plants. A comparatively small number of large loans has been made during the year, but several small loans have been made to American specialists. These loans have resulted in all cases in a decided mutual advantage to both parties concerned.

Statistical Summary (For the year ending December 31, 1921:

Number of specimens received on new accessions:			
By purchase	3,402		
By gift	1,506		
By exchange	4,194		
Total	9,102	valued at	$910.20
Number of specimens mounted and incorporated	24,513	valued at	4,902.60
Number of specimens discarded from the herbarium	29		
Number of specimens in organized herbarium	886,308	valued at	137,134.90
Number of specimens in unorganized herbarium (estimated)	67,167	valued at	5,373.36
Wood specimens, etc., supplementing the herbarium		valued at	280.00
Microscope slides, etc		valued at	410.00
Total valuation			$149,011.06

LIBRARY

The usual library work of checking up and entering current numbers of the many hundreds of serial botanical publications which the library receives annually, collating the volumes for binding after their parts have made the round of the scientific staff, and finally distributing these volumes and other accessions of the year upon the book shelves has been kept well in hand during the year. Good progress has been made also in securing many publications which could not reach us during the great war, atlhough some series are still incomplete.

Use of Library by Botanists Not Connected with the Garden.—As stated from month to month in the Garden BULLETIN, many botanists have visited the library during the year to work up or to consult the literature in their special fields. Two such visitors of wide experience in consulting libraries—one from Kew Herbarium and the other from the Cryptogamic Herbarium of Harvard University—spoke in highest praise of the range and completeness of our library and of the promptness with which the library staff placed the resources in unusual works before them. During the year there have been loans of 96 books to 28 institutions on the interlibrary plan for use by their botanists.

Publications.—The publication of vol. VIII, the current volume, of the ANNALS OF THE MISSOURI BOTANICAL GARDEN was held up during several months of the year by the printers' strike, so that of this quarterly only two numbers have been issued during the year; part 3 is in page proof now and the remaining part to complete the volume will appear as soon as the printer can handle it. The ANNALS is our principal exchange for publications of scientific societies and institutions. The Garden publishes also, but chiefly for local circulation, the GARDEN BULLETIN. This latter publication is apparently filling a distinct need among those amateurs interested in the establishment of gardens in this part of the country. While the BULLETIN was originally intended to serve primarily as a means of informing the public what was of particular interest at the Garden, for the last two years special attention has been given to native and exotic plants suitable for the gardens of Missouri and adjoining states. As a consequence we have had requests for copies of the publication from a large number of individuals throughout the state, and since most of the horticultural publications copy nearly

every month, one or more articles from the BULLETIN, the demand for this publication all over the United States is rapidly increasing. Visitors from the East and the far West not infrequently ask to see some special plant or collection which they have read about either in the BULLETIN or in some publication copying one of our articles.

Both the ANNALS and the BULLETIN are supplied to regular subscribers; separates of the various articles in the ANNALS are also for sale by the library. The cash receipts from such sales for the year were $407.00.

Statistical.—There have been donated to the library during the present year 536 volumes, valued at $1,113.44 and 1,840 pamphlets, valued at $353.91; and 393 volumes were bought at a cost of $1,836.18, and 63 pamphlets, costing $46.76. The library now contains 38,483 books and 51,387 pamphlets, a total of 89,870, valued at $131,449.71. There are also 330 manuscripts, valued at $1,609.80, and 957,956 index cards, valued at $9,885.01. A total of 11,480 index cards have been added during the year, of which 1,102 were typewritten by library employees, and 10,378 purchased at a cost of $193.52. Five hundred and ninety-one books were bound.

Respectfully submitted,

GEORGE T. MOORE,
Director.

STATISTICAL INFORMATION FOR DECEMBER, 1921

GARDEN ATTENDANCE:

Total number of visitors	9,717

PLANT DISTRIBUTION:

Total number of seed packets distributed in exchange.	66

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	33
Total number of books and pamphlets donated	142

HERBARIUM ACCESSIONS:

By Gift—	
Drushel, J. A.—Plants of Vermont, New York and Missouri	23
Kellogg, John H.—Garden specimens of medicinal plants	44
Kellogg, John H.—*Lonicera* sp.	1
Stevens, Professor F. L.—Higher fungi of Hawaii	169
Zeller, Dr. S. M.—Fungi of Oregon	9
By Exchange—	
Grant, J. M.—Mosses, hepatics, and fungi of Washington	125
U. S. National Herbarium—Miscellaneous herbarium duplicates	544
Total	915

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from November to April, 1:00 P. M. until sunset, from April to November, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

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MISSOURI BOTANICAL GARDEN BULLETIN

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THE DANIEL BOONE JUDGMENT TREE.
(ULMUS AMERICANA).

Missouri Botanical Garden Bulletin

Vol. X St. Louis, Mo., February, 1922 No. 2

THE DANIEL BOONE JUDGMENT TREE

The Daniel Boone Judgment Tree, under which Daniel Boone held court during the early part of the nineteenth century, has been the subject of considerable discussion, both as to what and where it was. It has at various times been reported to be a poplar, an elm, and a sycamore, and in order to settle the question an expedition was sent out from the Garden last fall in the hope of locating the tree and getting some accurate information concerning it.

What is unquestionably the so-called "Daniel Boone Judgment Tree" was finally located on the old Boone homestead at Darst's Bottom, Femme Osage, now owned by Mr. Henry Bollmann. Femme Osage is the name given by Daniel Boone to a creek because an Osage Indian woman was drowned here. There is a small village which takes its name from the creek and there was formerly a post-office located here. The Femme Osage post-office was abandoned about twelve years ago, all the mail for the village now going through Augusta on a rural route. The tree is about five miles east of Femme Osage village and five miles west of the village of Defiance, on the Femme Osage Creek road. It is growing on the bank of a shallow ravine, about 150 feet northwest of the stone house which was built by Nathan Boone, Daniel Boone's youngest son, and about forty feet south of the site formerly occupied by the old log house of Daniel Boone. The tree, which is an American elm *(Ulmus americana)*, is sixty-five feet high, forked about three feet from the ground, each branch measuring nine feet in circumference at the fork. The main trunk is sixteen feet six inches in circumference two feet from the ground. The main branch to the west is badly decayed with large open cavities extending into the heart-wood. The main branch on the east which grows more nearly

upright is in fairly good condition. The entire tree, however, is in a poor state of preservation, several large branches which have been broken off by wind and ice during past years still being lodged in the tree.

According to Walter B. Stevens' Centennial History of Missouri, Boone's visit to Missouri from Kentucky in 1798 was inspired by the Spanish government. He found the region so much to his liking that he decided to settle in Missouri, making his first home at Marthasville. Later he moved to Femme Osage, where a son had built a log cabin. This was replaced by a pretentious stone house, where Boone lived until his death. This was apparently the first stone house built in St. Charles County and required eight years for its completion. All the stone used was hauled on stone sledges drawn by oxen from a hillside on the eastern part of the farm. The interior woodwork is black walnut, cut from trees on the place and is of the hand-made wooden-pegged variety of the period.

After settlers began to flock to the vicinity of the Boone homestead, he was elected "Syndic" of the district, which office made him the foremost man of the locality. One of his duties was to hold court from time to time, passing on both civil and federal cases. Offenders were not infrequently sentenced to a given number of lashes on the bare back. After the United States obtained control of this region, the jurisdiction of the territorial court was extended to include the district formerly presided over by Boone, and eventually a courthouse was erected at St. Charles. The habit of appealing to Boone and accepting his opinions without question was too firmly fixed in the minds of the settlers to admit of their accepting the new arrangement; consequently, as long as he lived he continued to hold court under the elm tree in front of his house and here the troubles and grievances of his neighbors were adjusted according to the principles of common sense.

The Garden is indebted to Mr. Ernst Robyn and Mr. Edgar Thoroughman, of Augusta, Mo., for information leading to the location of the tree and for certain facts included in the above article. Thanks are also due to Mr. and Mrs. Henry Bollmann, who gave permission for the taking of the accompanying photographs.

BOONE HOMESTEAD IN WHICH DANIEL BOONE DIED.
(MODERN PORCH ADDED).

BIRD OF PARADISE FLOWER.
(STRELITZIA REGINAE).

BIRD OF PARADISE FLOWER (STRELITZIA REGINAE)

The genus Strelitzia belongs to the Musaceae or banana family and greatly resembles the banana in habit of growth. It is a native of South Africa and includes about five species, three of which are represented in the Garden collection. *Strelitzia augusta,* the arborescent type, described in the June, 1918, number of the BULLETIN, is the largest-growing of the five species. The species *S. Reginae* is by far the most gorgeous of the group. It was introduced into cultivation in 1773 by the Royal Botanic Gardens, Kew, England, through the efforts of Sir Joseph Banks, who named it in honor of Queen Charlotte of the family of Mecklenburg-Strelitz, wife of King George III. The striking coloration and oddity of its flowers soon brought the plant into prominence, as much as twenty-five dollars having been paid to collectors in Africa for a single small specimen. Despite its early introduction, the plant is rarely seen outside botanical gardens, except where it is possible to naturalize it outdoors, as in California. Its luxuriant colors, combined with the bird-like appearance of the flower, suggested the name "Bird of Paradise."

In habit the plant is perennial. The roots are somewhat rhizomatous, suggesting the growth of carrots. The leaves emerge directly from the ground, supported on long stems or petioles, unlike *S. augusta,* which forms a true trunk. The unbranched flower spike towers above the foliage, is circular in shape, of equal thickness throughout, embraced with four or five sheaths, and is of a glaucous color. The number of flower spikes to each plant is governed by the age of the plant. Terminating the flower stem is a horizontal spathe about eight to ten inches long, of a glaucous color, with a fine bright purple base, extending to the pointed end. In the process of development the spathe, or protective covering for the flowers, opens from above within an inch of the apex, where the edges roll to one side forming an angle of 45 degrees. This permits the recession and opening of the flowers, which are arranged one behind the other within the spathe. After a blossom has been open for a day or so it recedes, making room for the next bloom pushing out from the spathe. This peculiar operation is repeated until all the flowers, usually six or eight in number, have emerged from their covering.

The upper petals are bright orange in color; the lower

petal, sometimes called the tongue of the bird, is long-lanced and keeled through the middle, and is of deep azure color, making a gorgeous contrast with the upper petals.

Plants of *S. Reginae* are easily cultivated, requiring heavy soil and plenty of water and sunlight. When grown in tubs they are serviceable for the conservatory and for the porch or lawn in summer. However, the best results, from the standpoint of flower production, are obtained from planting directly in the ground in the conservatory.

VANISHED PLANTS OF OUR LOCAL FLORA

The territory here considered as covering our local flora is that defined in the "Preliminary Check List of the Cryptogams and Phanerogams in the Vicinity of St. Louis, Mo.," published by the Engelmann Botanical Club, 1911, as follows: "From the mouth of the Missouri River east to the top of the Illinois Bluffs, south along the tops of these bluffs to a point opposite the mouth of the Meramec River; following the Meramec River and including the bluffs on both sides to a point opposite Pacific, Mo., from there directly east to the Missouri River and following the south side of the river to the starting point."

The area includes the so-called American bottoms, through which flows the Mississippi River. This bottom varies in width from four to eight miles, the greater portion of which is in the state of Illinois. A part of it is occupied by bodies of water, some being connected with the river. On the Missouri side, at some places, the limestone bluffs approach the river's edge. The Missouri plateau is of a rolling nature, intersected by numerous small valleys. The surface is partly wooded, partly open, covered with a growth of herbs and shrubs. A notable feature of this plateau is the sink-holes, funnel-shaped depressions which form natural drains for the immediate surroundings. Where these sink-holes have been partly filled with sediment, water has collected, forming ponds. The principal modification of the upland plateau is the ravines which have been cut by water and through which the surface waters drain into the rivers. Along the Meramec and Missouri rivers are large areas of bottom land, subject to occasional floods.

Our local flora has been modified within recent years by various physical influences, causing the elimination and dis-

appearance of certain species of plants and the appearance of others new to the locality. Large portions of the original forest have been cut out to be replaced by farms. The wooded slopes of ravines have been denuded, and erosion of the soil has taken with it, in some cases, all of a certain species of plants. Railroads have brought about entirely new conditions, causing the disappearance of some plants and the appearance of many others. Floods have taken and brought species of plants within our local territory. Pasturing has denuded large areas of herbaceous vegetation, and not a few plants have, at least partly, been eliminated by thoughtless persons who have removed them from their native habitat, pulling them out by the roots from the loose soil in the woods and attempting to grow them in unsuitable positions in gardens and yards.

The following list is based on the reports on local plants by the botanists who have collected in this vicinity from about the time of the arrival in St. Louis of Dr. George Engelmann, in 1835. Practically every species mentioned is to be found in the herbarium of the Garden, an indisputable evidence of its former existence in this locality. The following species may still perhaps be found in some little-explored or inaccessible locality, but their discovery is very doubtful: *Caulophyllum thalictroides, Cheilanthes lanosa, Cimicifuga racemosa, Collinsia verna, Commelina hirtella, Corallorhiza maculata, Festuca elatior, Gentiana Andrewsii, Hypericum petiolatum, Lilium philadelphicum, Monotropa Hypopitys, Salvia lyrata, Selaginella rupestris,* and *Stenanthemum angustifolia.*

LIST OF PLANTS VANISHED FROM OUR LOCAL TERRITORY

Botanical name	Common name	Locality where last found*
1. DESTROYED BY CULTIVATION		
Allium tricoccum	Wild leek	River bottoms near Allenton, Mo.
Chelone glabra	Turtle-head	River bottoms around Pacific, Mo.
Collinsia verna	Innocence	Rich soil, creek and river bottoms
Habenaria lacera	Ragged orchis	Rich soil, Illinois bluffs
Hypericum adpressum	Creeping St. John's-wort	Low grounds, Allenton, Mo.
Hypericum petiolatum	Marsh St. John's-wort	River bottoms near Allenton, Mo.
Liparis Loeselii	Fen orchid	Moist thickets near Allenton, Mo.
Melanthium virginicum	Bunch flower	Low open woods
Ptilimnium Nuttallii	Mock bishop-weed	Wet bottoms, Allenton to Pacific, Mo.
Stellaria longifolia	Long-leaved stitchwort	Swampy bottoms
Stenanthium robustum	Stout stenanthium	Rich bottoms, Eureka, Mo.
2. DESTROYED BY CULTIVATION AND PASTURAGE		
Botrychium obliquum	Moonwort	Rich hillsides, open woods, Valley Park, Allenton, Mo.
Erythronium americanum	Yellow adder's-tongue	Moist woods, Creve Coeur, Batrock, Mo.
Festuca elatior	Meadow fescue	Shady hillsides, Allenton, Mo.
Habenaria flava	Small pale-green orchis	River bottoms
Liparis liliifolia	Large twayblade	Rich shady thickets and ravine banks, Pacific, Mo.

*Where no definite locality is given, the plants were formerly generally distributed throughout our local territory.

Botanical name	Common name	Locality where last found
3. DESTROYED BY CULTIVATION AND VANDALISM		
Gentiana Andrewsii	Closed gentian	Swampy land
Orchis spectabilis	Showy orchis	Rich woods, Allenton, Mo.
Osmunda regalis	Royal fern	Swampy ground
Stenanthemum angustifolia	Grass-leaved stenanthemum	Open woods
4. DESTROYED BY DRAINAGE AND CULTIVATION		
Eleocharis quadrangulata	Spike-rush	Lakes and ponds, Allenton and Dozier, Mo.
Habenaria leucophaea	Prairie white-fringed orchid	Moist open places, Illinois bluffs
Osmunda Claytoniana	Clayton's fern	Wet grounds
5. DESTROYED BY PASTURAGE		
Carex communis	Fibrous-rooted sedge	Dry shaded woods, Allenton, Mo.
Caulophyllum thalictroides	Blue cohosh	Woods and shady banks, Creve Coeur Lake and Allenton, Mo.
Cheilanthes lanosa	Hairy lip-fern	Sandy rock ledges, Pacific, Mo.
Cimicifuga racemosa	Black cohosh	Shady banks in rich woods
Corallorhiza maculata	Large coral-root	Rich shady hillsides, Allenton and Batrock, Mo.
Evolvulus argenteus	Evolvulus	Dry hills, Allenton and Pacific, Mo.
Gentiana flavida	White gentian	Dry open hills
Gentiana quinquefolia	Stiff gentian	Moist ground, Eureka, Mo.
Leavenworthia uniflora	Michaux's leavenworthia	Dry open places, Eureka, Mo.

Botanical name	Common name	Locality where last found
Monotropa hypopitys	False beech drops	Dry woods, Allenton, Mo.
Pogonia trianthophorus	Nodding pogonia	Rich woods, Valley Park, Mo.
Rumex hastatulus	Engelmann's sorrel	Sandy soil, Allenton, Mo., and French Village, Ill.
Salvia lyrata	Lyre-leaved sage	Limestone glades, Eureka and Batrock, Mo.
Selaginella rupestris	Rock selaginella	Dry sand rock, Pacific, Mo.
Tradescantia flexuosa	Spiderwort	Sandy ravines, Allenton, Mo.
6. DESTROYED BY PASTURAGE AND VANDALISM		
Cypripedium pubescens	Large yellow lady's slipper	Woods, thickets and rich shady hillsides
Hexalectris aphylla	Crested coral-root	Rich woods, Pacific, Allenton and Dozier, Mo.
7. DESTROYED BY VANDALISM		
Lilium philadelphicum	Wood lily	Dry woods and thickets
8. WASHED OUT BY THE MISSOURI RIVER		
Commelina hirtella	Bearded day-flower	River banks near Pacific, Mo.
9. DESTROYED BY REMOVAL OF SAND ON WHICH PLANTS WERE GROWING		
Microstylis unifolia	Green adder's mouth	Sand hill near Pacific, Mo.
Polypodium polypodioides	Gray polypody	Sand hill near Pacific, Mo.

Botanical name	Common name	Locality where last found
	10. DESTROYED BY CITY EXPANSION	
Crataegus fecunda	Hawthorn	The only known specimen of this tree, from which all now in cultivation originated, was destroyed by the expansion of East St. Louis, Ill.
Hottonia inflata	American feather-foil	Ponds and lakes. This plant was found in a pond in North St. Louis. The pond has been filled and its exact location obliterated by streets and buildings.

NOTES

Dr. Hermann von Schrenk, Pathologist to the Garden, has been elected president of the Missouri Forestry Association which was organized December 7.

Mr. L. P. Jensen, Arboriculturist to the Garden, gave an illustrated talk before the St. Louis Florists' Club, January 9, on "Our Vanishing Wild Flowers."

Dr. B. M. Duggar, Physiologist to the Garden, spoke before the biologists of Washington University, February 3, on "Filterable Diseases of Plants and Some Recent Studies on the Mosaic Disease of Tobacco."

The January-February issue of Parks and Recreation contains the following articles by Mr. L. P. Jensen: "A College Course for Nurserymen"; "Oldest Living Trees"; and "Publications of Interest to Park Executives."

Among those visiting the Garden recently were Dr. Otto Warburg, professor of botany, University of Berlin, Germany; Professor H. W. Anderson, assistant professor of botany, University of Illinois; Professor John T. Buchholz, professor of botany, University of Arkansas.

Mr. G. H. Pring, Horticulturist to the Garden, gave an illustrated lecture before the St. Louis Florists' Club, January 13, on "A Trip through the American and African Tropics." He also spoke before the Men's Club of the Church of the

Redeemer, January 31, on "The Relation between Insects and Flowers."

Mr. H. M. Jennison, assistant professor of botany and bacteriology at Montana State College, Bozeman, has been granted leave of absence and will spend the remainder of the college year in the graduate laboratory at the Garden in the completion of the work begun several years ago toward a doctor's degree.

Dr. M. C. Merrill, formerly Rufus J. Lackland fellow at the Garden, now professor of horticulture, Utah Agricultural College, Logan, has accepted an appointment as dean of the College of Applied Arts and as head of the department of horticulture of the Brigham Young University. The appointment is to take effect July 1.

An interesting side-light is thrown upon some of Mr. Shaw's financial activities in a reference to the organization of the Northwestern Fur Company, to be found in Chittenden's "American Fur Trade of the Far West". It is here recorded that in 1831 Narcisse Leclerc, a former employee of the American Fur Company, concluded to try his own hand at the business. Leclerc was outfitted by Henry Shaw under the style of the Northwestern Fur Company. Difficulties between this company and the American Fur Company began almost at once and as a result of various encounters Leclerc returned to St. Louis and brought suit against the American Company. This was finally compromised by paying Leclerc $9,200.

STATISTICAL INFORMATION FOR JANUARY, 1922

GARDEN ATTENDANCE:

Total number of visitors	11,456

PLANT ACCESSIONS:

Total number of plants received in exchange	2
Total number of plants and seeds received as gifts	23

PLANT DISTRIBUTION:

Total number of plants distributed	229

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	28
Total number of books and pamphlets donated	148

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from November to April, 1:00 P. M. until sunset, from April to November, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

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MISSOURI BOTANICAL GARDEN BULLETIN

Vol. X MARCH, 1922 No. 3

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MAGNOLIA GRANDIFLORA IN GARDEN OF MR. LEONARD MATTHEWS.

Missouri Botanical Garden Bulletin

Vol. X St. Louis, Mo., March, 1922 No. 3

GREAT LAUREL MAGNOLIA OR BULL BAY

A specimen of great laurel magnolia (*Magnolia grandiflora*) growing in the garden of Mr. Leonard Matthews, 5447 Cabanne Avenue, St. Louis, is one of the best examples of a subtropical tree acclimating itself in Missouri. In 1891 Mr. Matthews purchased 50 plants of *M. grandiflora* from a southern nurseryman and planted them in selected places in his garden. The climatic conditions during the summer being similar to those of the south, the young trees became established, but with the advent of winter all froze and subsequently died except one specimen which was planted in a somewhat secluded position. It is growing upon the west end of an embankment facing the Hodiamont street-car tracks, and is protected on the north by residences and on the west by a spacious garage, which no doubt accounts for its having survived the severity of our winters. It is conical in shape, 20 feet high, with a well-developed trunk measuring 1 foot in diameter at the base.

Several attempts have been made at the Garden to establish *Magnolia grandiflora*, and one poor specimen which has been frozen back so often that it presents a shrub-like appearance, may be found south of the old Shaw residence. The plant is over 20 years old, and in early days was protected in the winter, but in spite of this covering it would freeze annually. The Cabanne specimen, however, has not been given any protection other than the natural environment, but despite this fact has become acclimated to the zero weather of the past 30 winters.

Magnolia grandiflora is naturally distributed along the Atlantic coast from North Carolina to Florida (Mosquito Inlet and Tampa Bay), west along the Gulf coast to the Brazos River in Texas, north along the Mississippi bluffs and bayous into northern Louisiana and southern Arkansas. Under cul-

tivation it is grown as an ornamental tree, being frequently used in the southern states as a street tree, but it is not a graceful species, as the limbs, twigs, and leaves are stiff and erect. It is hardy in Washington, D. C., and its northern limit extends to Philadelphia. It is cultivated to a great extent in Europe and is often trained upon a wall with a southern exposure when there is difficulty in getting it established. An example of this method of culture may be seen at the Kew Gardens, London, where a superb specimen is grown upon the southern wall of the old herbarium building. In the forests of Louisiana, the tree grows to perfection, reaching a height of 80 feet with a trunk 4 feet in diameter.

Description.—Branches ascending, leaves alternate, oval, 5-8 inches long, leathery, shining above, rusty pubescent beneath or smooth and dull green, persistent until the second spring. Flowers from April to August, white, cup-shaped, 6-8 inches in diameter, in the horticultural variety *gloriosa* 14 inches, solitary on the end of the twigs; odor so fragrant as to be disagreeable to most people; sepals 3, petal-like; petals thick, waxy, 6-9; stamens many, purple at the base; pistils many, crowded. Fruit oval, 3-4 inches long, rusty brown, pubescent; seeds flat, red, 2 in each cell, hung down on threads, ripening in the fall.

This is the species which furnishes the splendid evergreen foliage used for Christmas decorations. The upper surface of each leaf is a dark lustrous green; the lining of rusty red fuzz is shed when the leaf is old.

MAGNOLIAS FOR ORNAMENTAL PLANTING

Among the best ornamental trees and shrubs for this locality are the magnolias. They have about the largest flowers of any trees in cultivation, and in many species they bloom before the appearance of the leaves in early spring. The foliage is massive and tropical in appearance, while the fruit of most species is attractive in summer and autumn. The majority of the magnolias are easy to grow and do well in the smoky atmosphere of cities. Their comparative infrequency in St. Louis is probably due to the following facts: They are rather slow in growth and take a longer time to attain their beauty and copiousness of flowers than most of our common ornamental trees and shrubs; they are not as

easily transplanted as the ordinary woody plants, it being necessary to dig them with a ball of earth adhering to their roots and to move them in the spring just before the breaking open of the leaf buds; as they have not been greatly exploited by nurserymen they are not generally included in planting lists; magnolias were formerly imported in large quantities from Europe, but lately the National Quarantine Act, which forbids the importation of plants with earth adhering to their roots, has made this impossible; and as these plants can be grown considerably cheaper in Europe than in America, the price has increased and caused a scarcity of material.

There are 20 species of magnolias, of which 6 are native to eastern and southern North America, 2 to Mexico, and 12 to southern Asia. There is also a number of varieties. The following species are perfectly hardy in this section of the country:

Magnolia virginiana (sweet bay).—The natural range of this species is rather remarkable, as it is found from Massachusetts to Florida and westward to Arkansas and Texas. In the most favorable location of its range it reaches a height of 50 to 75 feet, but elsewhere it is often a shrub of many stems. Under cultivation in St. Louis its maximum height is about 30 feet. As the many stems make it broad and shrubby, an abundance of space is needed for its maximum development, the species being valuable for individual specimens or for the edge of plantations.

This magnolia is literally covered with fragrant white cup-shaped flowers 2-3 inches in diameter, which bloom in late April or May and occasionally during the summer. The leaves are oval, 3-5 inches long, leathery in texture, shining green above, paler beneath. In the fall the shiny red seeds hung on slender threads from the cones are very attractive. The preferred habitat is a rich moist soil on river banks and borders of swamps, but the tree grows well in rich upland soil also.

Magnolia virginiana var. *longifolia*.—This variety has lance-shaped leaves and continues blooming longer than the type.

Magnolia acuminata (cucumber tree).—This is the hardiest of our native magnolias. Its natural distribution is from western New York to Georgia, west to southern Illinois and Arkansas. It is pyramidal in form, of somewhat spreading habit, and grows to a height of from 60 to 100 feet. The leaves are 6-10 inches long, with a sharp-pointed apex and heart-shaped base, yellowish green in color, turning yellow in autumn. The flowers are 2-3 inches long, tulip-like, yellowish green, rather inconspicuous because of being surrounded by the young yellowish green leaves. The fruit is showy, resembling a cucumber in form, hence the common name. This tree is valuable for avenue and park planting and is also a good stock on which to graft the less hardy varieties.

Magnolia cordata (yellow cucumber tree).—This species is native to Georgia and Alabama. It is smaller than *M. acuminata*, of which it was formerly considered a variety, and has bright yellow flowers and almost evergreen leaves. The name *cordata* is derived from its broad heart-shaped leaves. This is a good tree for lawn and park planting.

Magnolia tripetala (umbrella tree).—This magnolia grows to a height of 40 feet and has spreading branches forming a rather open head. Its natural range is from Pennsylvania to Alabama, west to Arkansas and Mississippi. The leaves are bright green, smooth, thin, 10-15 inches long, obovate, with pointed apex tapering towards the leaf-stalk. The flowers are white, 8-10 inches in diameter, very showy, appearing in May. The flower is surrounded by a whorl of leaves which has been likened to an umbrella, hence the common name. The fruit is conspicuous. This is one of the finest of our native magnolias and should be planted in situations sheltered from the wind, as the large leaves are easily torn if not protected.

Magnolia Fraseri (ear-leaved magnolia).—This species attains a height of 30-40 feet and has wide spreading branches. Its natural habitat is from Virginia to Florida, west to Mississippi, in well-drained soil along mountain streams. The leaves are smooth, green, pale beneath, 8-20 inches long, with pointed apex, and ear-shaped lobes at the base. The flowers are creamy white, fragrant, blooming in May. The fruit is 4-5 inches long,

bright rose at maturity. This is a very desirable tree for lawn and park planting.

Magnolia Yulan.—This is a hardy species, native of China and Japan, which attains a height of 50 feet. The leaves are obovate-oblong, 4-7 inches long. The flowers are white, about 6 inches in diameter, blooming in April or early May. This is one of the most showy magnolias.

Magnolia Kobus.—This Japanese species is more pyramidal in form than *M. Yulan* but not so showy nor free-blooming. It grows to a height of from 60 to 80 feet and is very hardy. It makes a good lawn tree.

Magnolia obovata.—This large shrub is native to China and Japan. The leaves are 4-7 inches long, ovate-obovate. The flowers are large, white inside, purple outside, and bloom in May or June. This is not as hardy a species as those previously mentioned.

Magnolia Soulangeana.—This magnolia is a hybrid between *M. Yulan* and *M. obovata,* and forms a small tree or very large shrub. The flowers appear in early spring before the leaves and are very conspicuous. They are white on the inside and more or less purple on the outside and are often fragrant. There are many varieties of this species, differing mainly in time of bloom and deepness of purple in the flowers.

M. Soulangeana var. *Alexandrina* is one of the earliest magnolias to bloom.

M. Soulangeana var. *Norbertiana* is probably the latest to bloom.

M. Soulangeana var. *nigra* has dark purple flowers.

M. Soulangeana var. *Lennei* has deep crimson flowers.

Other varieties of *M. Soulangeana* differ but little in time of bloom and color of flowers. The early flowering of these magnolias makes them particularly desirable for mass planting and as individual specimens on the lawn.

Magnolia stellata (starry magnolia).—This is a shrub or small tree from Japan. It has spreading branches and is the first magnolia to bloom. Its fragrant white flowers about 3 inches in diameter appear in profusion in March before the leaves and make this plant a conspicuous object of early spring. This species is worthy of extensive planting in the foreground of shrubbery and particularly if it is given a background of evergreen foliage.

M. stellata var. *rosea* has its petals flushed with pink.

Magnolia parviflora.—This is a small tree from Japan. It bears white flowers flushed with pink which bloom in June.

Magnolia Watsonii.—This Japanese species is very closely allied to *M. parviflora.* Its large white flowers, with their centers of bright crimson stamens, are very handsome.

The following species of magnolia are not ordinarily hardy in St. Louis:

Magnolia grandiflora (bull bay).—See article on *Magnolia grandiflora* on page 37 of this BULLETIN.

Magnolia macrophylla (large-leaved cucumber tree).—This magnolia grows to a height of 50 feet and has spreading branches forming an open head. Its natural distribution is from Kentucky to Florida, west to Arkansas and Louisiana. It is remarkable for the size of its leaves which are often 3 feet long and proportionally wide. The flowers are cup-shaped, 10-12 inches in diameter, white, appearing in May. This species should be planted in a sheltered position to prevent the leaves from being torn to pieces by the wind.

Magnolia hypoleuca.—This is a Japanese tree which attains a height of 100 feet. The flowers are white with scarlet stamens, cup-shaped, 6-7 inches in diameter. The leaves are 8-14 inches long. This is a fine magnolia for the southern states.

Magnolia pumila.—This is a Chinese shrub attaining a maximum height of 12 feet. It is extensively cultivated in the southern states. The flowers are small, white, very fragrant.

HOW LONG CAN A SEED LIVE?

Probably no question concerned with plants has had so many contradictory and inaccurate answers as that dealing with the length of time a seed may retain its vitality. The wide circulation of such fables as the supposed germination of "mummy wheat" has left the impression, in the mind of the general public at least, that there is practically no limitation to the persistence of life when it is once enclosed in the seed-coats of a plant. The origin of this myth seems to be that about 1840 a dozen grains of wheat were sent to England with the statement that they had been taken from a vase found in one of the ancient tombs which contained a mummy. These seeds were sown, and one plant was said to have been raised which bore two poor ears. Just where the mistake occurred cannot be stated, but there is no doubt that the grain which germinated either never came from Egypt or was of recent origin and had not been buried for centuries. Wheat and other seeds have frequently been found in ancient Egyptian tombs, but a microscopic examination of such grain invariably shows that the embryo has acquired a brownish color and is practically destroyed. In no case would it be possible for it to germinate. Actual experiments have proved that out of 750 seeds of wheat stored under ideal conditions for 16 years only 8 per cent sprouted, and by the time the seed was from 30 to 35 years old no germination would take place.

Within the past year or two the daily press has given considerable space to the reported germination of morning-glory seed found in the hand of a mummy. While the accounts vary, in some cases the seed being reported as that of an Egyptian pea, they are more or less in agreement in stating that the Secretary for the Society of Bibliographical Archaeology of London brought from Egypt to England 12 seeds (the same number as in the original mummy wheat story) found in the hand of a mummy of a young girl which was excavated from a tomb nearly 5,000 years old. All the seed germinated, and when the plants matured blue morning-glories (or sweet-peas) "looking like a tiny Egyptian face" were produced.

Unfortunately, efforts to verify the actual conditions under which the seed were found have failed and, for the present at least, the case will have to be classed with still another one where the seeds of oats were supposed to have germinated after

removal from a mummy case 2,600 years old. The particular mummy was one presented to John Macgregor about 1870 by the Khedive of Egypt. When the mummy reached England the case was opened in the presence of creditable witnesses and in the dust at the bottom were found 4 oat seed. Two of these were sown by Macgregor and 2 turned over to the Royal Botanic Society of London for planting. All 4 seed germinated, and, because of the care with which the mummy case had been opened and the connection of the Royal Botanic Society with the growing of the seedlings, the case was regarded as absolutely authentic. While it seemed odd that only 4 seed were found and that these were precisely similar to varieties then in cultivation, no doubt was cast upon the truth of the incident until a long time afterward. It then developed that this identical mummy had been stored with others in the stables of the Khedive where fodder, including oats, was kept for the horses. The Khedive was in the habit of keeping on hand in his stables a stock of these most interesting products of his country, so that they would be ready at any time to present to distinguished visitors. It was shown that the dry air of the stable, together with rough usage, either warped and split the wood of the case or caused the clay luting which joined the two halves of the case to fall out, thus forming an opening through which the oats filtered in. There is no doubt that, for the purpose of deceiving credulous tourists, modern wheat or oats grains appropriately stained have sometimes been mixed with wheat taken from ancient vases and mummy cases and sold as "mummy wheat." Genuine vases, apparently unopened, but containing such grains, are also occasionally sold to travelers.

While the power which many seeds and spores possess of retaining their vitality under the most adverse conditions is one of the most interesting phenomena connected with plant life, it is only recently that there has been made available any trustworthy data upon the maximum life of a seed. In 1907 Becquerel tested the germination of about 500 kinds of seed which had been preserved in the Natural History Museum of Paris. The age of these seed could be definitely determined, varying from 25 to 135 years, but the oldest seed (*Cassia bicapsularis*) which Becquerel succeeded in germinating was 87 years old. In the following year Ewart published a list of over 4,000 varieties of seed which had been germinated

after varying lengths of time. About 600 species recorded by Ewart were from seed which had been sent out from Kew 40 years before for a projected botanical garden at Melbourne, but were locked up in a cupboard and forgotten. As the results of the investigations of these two workers, it was possible to make a significant generalization about the type of seed which show extreme longevity, namely, that all had exceptionally strong and impermeable coverings. Not only are coats of such seed impervious to air, but they are likewise impermeable to dry alcohol, ether, chloroform, and similar substances. These hermetically sealed seeds, therefore, are able to live longer because of protection from external influence.

Some seed retain their vitality but a few days. Others, if properly preserved, will germinate after years and possibly, in rare cases, a century or more may pass before they are lifeless. In any case a fundamental question concerning the state of the living matter in a dormant seed remains to be answered. Are vital processes slowly but continuously going on within a seed or is everything at a standstill? Originally it was believed, because seed could be immersed in various toxic substances or kept in a vacuum for a year or two without loss of vitality, that there could be no gaseous exchange between the contents of the seed and the outside. Some investigators contended that respiration, that is, taking in of oxygen and giving out of carbon dioxide, continually takes place in dry seed just as it is carried on in living plants and animals. Certain experiments seem to prove that seeds can exist for a considerable time without any gaseous exchange with the outside world since their walls have become absolutely air-tight. Hence, if there are any changes going on, each cell must be living on its own supplies, and the life of the seed is necessarily limited to the length of time required to use up such a source of energy. If, on the other hand, a dried seed has really entered into a state of "static equilibrium" in which no change whatever takes place, it should be capable of retaining its vitality indefinitely.

Becquerel has inaugurated an experiment which some day may answer the question but unfortunately we cannot anticipate an answer within this century, since time alone can be the test. He has prepared seed by perforating their outer coats and drying them completely, after which they were placed in a high vacuum and deposited with the Bureau of

Standards in Paris. They are to be tested every 10 years, and ultimately we may know how nearly seeds are immortal.

Since plants unquestionably have appeared in regions where they were previously unknown, after the soil had been opened up by digging or dredging, it was concluded that the seed must have been preserved alive for very long periods, because buried more or less deeply in the earth. Of course there has never been adequate supervision of such cases, and invariably it has been found that the plants recorded as appearing under such conditions do not have particularly long-lived seed, at least when preserved in air. Rather extensive experiments have further demonstrated that it is not true that seeds preserve their vitality longer if buried in the soil, but that they will keep much better in air if perfectly dry.

The appearance of unusual plants in regions cleared by forest fires has been regarded as another evidence of the extreme viability of seed. While it is true that some seed which have lain dormant in the earth for a considerable length of time may be germinated through the heating of the ground, there is no authority for the idea that plants originating under such circumstances have come from seed which have lain in the soil an extraordinary length of time. The possibility of their being carried by birds or other animals, or by wind or flood cannot be disregarded.

Pine seeds are notoriously long-lived. Some trees, such as *Pinus attenuata* and *P. radiata*, 30 or 40 years old, may still retain unopened all the cones they have produced. In such cases the cones may not shed their seeds until the tree or branch that bears them dies. In 1874 Dr. Engelmann collected a branch of *P. contorta* from Colorado and after keeping it in St. Louis for 4½ years, he sent it to Professor Sargent of the Arnold Arboretum to test the seeds. The results showed that at least some seeds of this species are capable of germination after retention in the cones for 10 years, and experiments conducted in the seed laboratory of the United States Department of Agriculture demonstrated that seeds of this same pine 30 years of age were still capable of germination.

All investigators are agreed that the viability of ordinarily dried seed is quite unaffected by exposure to extreme cold. What was regarded as a most remarkable fact at the time was the finding in January, 1899, by some members of the Peary arctic expedition, of seeds abandoned by Lieutenant Greely

18 years before, and which during this period had been exposed to a winter temperature of from 60 to 70 degrees below zero. Twenty-three years after these seeds were harvested some of them germinated, and this demonstration of the ability of seed to withstand low temperature was cited as one which would not likely be again repeated. Since that time seeds have been exposed to the temperature of liquid hydrogen (-250°C.) without deleterious results. Some contend that this proves the seed must necessarily be in a state of static equilibrium, since all chemical change must be in abeyance with such extreme cold. On the other hand, it is believed by many that any change would only be indefinitely retarded by the low temperature.

Plants resort to various expedients to prevent their means of perpetuation through seed being destroyed by heat or drought or excessive moisture. As a general rule, the thinner and more permeable the seed-coat the shorter-lived the seed, although sometimes the seed-coat may be relatively thin and yet quite impervious to moisture, as in the case of the garden pea. Again, the long life of the seed may be due to the excessively hard or the abnormally thickened seed-coat, and germination may not take place for several years after the seed has been exposed to favorable conditions. To the farmer or gardener delayed germination is a nuisance, since he desires all seed to germinate promptly and those of the same kind to appear at approximately the same time. Clover is a good example of a plant which produces seed with coats of varying thickness, so that from a single plant the so-called "hard" seed may germinate weeks or even months after the others. At one time a machine was devised which, by means of an air blast, forced the clover seed against rough iron plates, and these, by scratching the seed-coats, rendered them all equally permeable to moisture, and germination was more or less simultaneous. Still another method has been to submerge hard-coated seeds in strong acid, certain kinds being capable of standing this treatment for several hours without injury. Germination is thus secured within a reasonable length of time instead of requiring years.

An interesting instance of the adaptability of plants to meet special conditions is found in *Nelumbium speciosum*, the sacred lily of India, the seed of which, if sown as soon as ripe, germinate under water in less than a month. Should

the seed once get hard by being removed from the water, it is almost impossible to break it, so that years may pass without germination unless the coat has been scratched or filed. When this is done, however, and moisture admitted, they will germinate within 24 hours. The value to the plant of such a seed is that, should the pond in which it is growing dry up and the seed fail to fall into water, it can lie dormant awaiting a return to its natural aquatic habitat. It is interesting to note in this connection that seed of Nelumbium have retained their vitality for the longest period authentically determined thus far. Robert Brown, an English botanist of the early part of the nineteenth century, records that seeds of Nelumbium were sent by Sloan to the botanical department of the British Museum. A hundred and fifty years afterwards he found them in the original boxes in which they had been transmitted. Brown himself succeeded in germinating these seed, and there seems no reason to doubt the accuracy of his account. At the present time this stands as the record for the longevity of seed, and, owing to the nature of the Nelumbium seed, it is reasonable to suppose that they might retain their viability for such a period. However, in the case of wheat and similar seed supposed to have lived thousands of years, no credence is to be attached to the sensational assertions as to their longevity.

PLANT IMMIGRANTS OF OUR LOCAL FLORA

As most plants lack independent means of locomotion, their dissemination is dependent upon outside agents. Many plants owe their wide distribution to water fowl whose habit of migration permits them to carry seeds in earth on their feet or in their plumage. Plants, such as currants, gooseberries, apples, etc., whose seeds are enclosed in edible areas and are protected by hard coats permitting them to pass through the bodies of animals without injury, are often carried long distances, and if deposited in favorable locations for growth soon start independent colonies. Migrating mammals aid in the distribution of such plants as burdock, tick trefoil, and beggar's lice, the seeds being provided with prongs or hooks which become attached to the furs of the animals. Other plants whose seeds possess tufts of fine feathery hairs, such as dandelions, thistles, and asters, are widely distributed by wind currents, as are also plants of the tumbling habit, in

which the stem and branches assume a spherical form, become detached from the plant and roll like a ball, scattering the seed as they go. Examples of this form of dissemination are the Russian thistle, tumbling mustard, and tumble grass. Some seeds are provided with buoyant apparatus which permits them to be carried by currents of water, many heavy seeds being distributed in this manner. Nuts and acorns planted by squirrels and birds to provide a future food supply, if not found by the animals and if planted in suitable soil and situation, germinate. Man has been one of the most important agents for the distribution of plants. The Pilgrims who arrived on the Mayflower carried with them seeds of herbs and ornamentals. Many of these have escaped from cultivation and become thoroughly established, sometimes locally, sometimes over a large territory. All sorts of seed are carried with freight, often unnoticed but none the less important. Thus, not only from adjacent territory but from distant states and from countries across the seas have come those plants which we designate as immigrants. These may be divided in two groups (1) transients, which establish themselves for a short period, then disappear, and (2) permanently established, which find conditions congenial and remain indefinitely.

The following table gives a list of the more important plant immigrants of the transient class. For definition of boundaries of our local flora, see article on "Vanished Plants of Our Local Flora" in the February, 1922, BULLETIN.

PLANT IMMIGRANTS OF OUR LOCAL FLORA
1. TRANSIENTS

Scientific name	Common name	Locality where found	Natural distribution
		PLANTS NATIVE TO NORTH AMERICA	
		Distributed by Railroads	
Allium mutabile	Wild onion	Near Allenton, Mo.	S. C. to Neb., south to Fla. and Tex.
Amphiachyris dracunculoides	Amphiachyris	Near Pacific, Mo.	Mo. and Kan. to Tex.
Argemone alba	White prickly poppy	Near Allenton, Mo.	S. D. to Tex., Ariz. and Mexico, east to Fla.
Argemone intermedia	Prickly poppy	Around stock yards, East St. Louis, Ill.	Neb., south and west
Aristida purpurea var. *longisita*		Along Cahokia Creek, Ill.	Colo., south to Tex.
Baptisia tinctoria	Wild indigo	Allenton, Mo., and East St. Louis, Ill.	Me. to Minn., Fla. and La.
Bergia texana	Texas bergia	Around stock yards, East St. Louis, Ill.	S. Ill. to Tex., west to Nev. and Cal.
Bromus Kalmii	Kalm's chess	Near Allenton, Mo.	Quebec to Manitoba, south to Mass., Ill., and Ia.
Callirrhoe triangulata	Clustered poppy-mallow	Stock yards, East St. Louis, Ill.	Ill. to Minn., south to Tex.
Clematis crispa	Marsh clematis	General	S. E. Va. to Fla. and Tex.
Corydalis micrantha	Small-flowered corydalis	Allenton, Mo.	Minn. to Mo. and Tex., east to Fla. and N. C.
Delphinium consolida	Field larkspur	Near Pacific, Mo.	Pa. to Minn., south to N. C. and Ala.
Desmanthus leptolobus	Prairie mimosa	Allenton, Mo.	Kan. to Tex.
Diodia virginiana	Large button-weed	Near Allenton, Mo.	N. J. to Fla., west to Ark. and Tex.

Scientific name	Common name	Locality where found	Natural distribution
	PLANTS NATIVE TO NORTH AMERICA Distributed by Railroads		
Froelichia floridana	Florida froelichia	Near Allenton, Mo	Ill. and Minn. to Neb. and Colo., south to Tenn. and Fla.
Gaura parviflora	Small-flowered gaura	South St. Louis	Mo. to La. and Tex., west to Ore. and Utah
Glycyrrhiza lepidota	Wild licorice	East St. Louis, Ill	Hudson Bay to N. M. and west
Grindelia squarrosa	Broad-leaved gum plant	Stock yards, East St. Louis, Ill	Ill. to Minn., south to Mo., Tex., Nev. and Mexico
Lepachys columnaris	Prairie cone-flower	Near Pacific, Mo	N. W. Terr. to Minn., Tex. and Ariz.
Petalostemum villosum	Hairy prairie-clover	Allenton and Pacific, Mo	Wis., south to Tex., west to the Rockies
Portulaca pilosa	Hairy portulaca	Jefferson Barracks, Mo	N. C. to Fla., Kan. and Tex., west to Cal.
Satureia glabra	Low calamint	Meramec Highlands and Valley Park, Mo	N. Y. to Minn. and Tex.
Solanum elaeagnifolium	Silver-leaved nightshade	Stock yards, East St. Louis, Ill	Kan. to Tex. and Ariz.

Scientific name	Common name	Locality where found	Natural distribution
	EXOTIC PLANTS		
Amaranthus Blitum	Amaranth	St. Clair Co., Ill.	Europe
Anagallis arvensis	Red or scarlet pimpernel	Near Allenton, Mo.	Europe
Anthoxanthum odoratum	Sweet vernal grass	General	Europe
Bromus tectorum	Downy brome-grass	Near Allenton, Mo.	Europe
Cynodon dactylon	Bermuda grass	General	Europe
Echium vulgare	Viper's bugloss	St. Louis and East St. Louis, Ill.	Europe
Malva sylvestris	High mallow	Near Allenton, Mo.	Europe and Siberia
Parthenium Hysterophorus	Parthenium	East St. Louis, Ill.	West Indies
Phalaris canariensis	Canary grass	General	Europe
Salsola Kali	Saltwort	North St. Louis	Europe and Asia
Silene latifolia	Bladder campion	Near Pacific, Mo.	Europe
Sonchus arvensis	Corn sow-thistle	Stock yards, East St. Louis, Ill.	Europe
Spergula arvensis	Spurry	Near Eureka, Mo.	Europe
	Distributed by Rivers		
Cleome serrulata	Stinking clover	General	Minn. to N. Ill., Kan. to W. Mo.
Pluchea camphorata	Salt-marsh fleabane	American Bottom	Coast of Mass. to Fla., also in the W. I.
	Distributed by Wind or Birds		
Orobanche ludoviciana	Louisiana broom-rape	Near Crescent, Mo.	Ill. to the N. W. Terr., south to Tex., Ariz. and Cal.
Salvia azurea var. *grandiflora*	Pitcher's sage	Mouth of the Meramec River	Mo., Kan., Colo. to Tex.
Talinum parviflorum	Small-flowered talinum	Near Pacific, Mo.	Minn. to Ark., N. M. and Tex.

NOTES

Mr. L. P. Jensen, Arboriculturist to the Garden, gave an illustrated lecture before the Study Club of Collinsville, Illinois, March 7, on "Arboriculture."

Dr. B. M. Duggar, Physiologist to the Garden, gave a talk on "The Life Relations of Some of Our Wild Mushrooms," before the Webster Groves Nature Study Society, March 3.

The February issue of the Gardeners' Chronicle of America contains an illustrated article on "The Orchid Exhibit at the Missouri Botanical Garden," by Mr. G. H. Pring, Horticulturist to the Garden.

Dr. George T. Moore, Director of the Garden, spoke before Centenary Methodist Church, March 1, on "What to See at the Missouri Botanical Garden," and before the vocational class of Cleveland High School, March 10, on "Professions Depending Upon Botany and Gardening."

Dr. George T. Moore headed a discussion on "Co-operation of Civic and Scientific Institutions in Establishing a Natural History Museum in St. Louis," given at the Public Library, February 22, under the auspices of the St. Louis Natural History Museum Association.

The following spring flowers have been noticed blooming out of doors at the Garden: snowdrop *(Galanthus nivalis)*, since February 15; pussy-willow *(Salix cinerea)*, March 1; chickweed *(Stellaria media)*, March 1; fragrant honeysuckle *(Lonicera fragrantissima)*, March 10; hazel *(Corylus americana)*, March 14; narcissus (*Narcissus Pseudo-Narcissus*), March 16; crocus *(Crocus vernus)*, March 16; silver maple *(Acer saccharinum)*, March 17; Cornelian cherry *(Cornus mas)*, March 18; golden-bell *(Forsythia intermedia* and *F. viridissima)*, March 18; liver-leaf *(Hepatica acutiloba)*, March 18; jasmine *(Jasminum nudiflorum)*, March 18; elm *(Ulmus americana, U. campestris*, and *U. fulva)*, March 18. A comparison of the time of blooming of the same plants in 1921 and 1922 (see February, 1921, BULLETIN), shows that all the plants flowered from two to four weeks later this spring than last, this being a more normal season.

STATISTICAL INFORMATION FOR FEBRUARY, 1922

GARDEN ATTENDANCE:

Total number of visitors	8,997

PLANT ACCESSIONS:

Total number of seed packets received in exchange	146

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	26
Total number of books and pamphlets donated	158

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from November to April, 1:00 P. M. until sunset, from April to November, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

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OF THE MISSOURI BOTANICAL GARDEN

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GEORGE T. MOORE.

BENJAMIN MINGE DUGGAR,
Physiologist in charge of Graduate Laboratory.

EDWARD A. BURT,
Mycologist and Librarian.

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W. F. LANGAN,
Engineer.

H. VALLENTINE,
Construction.

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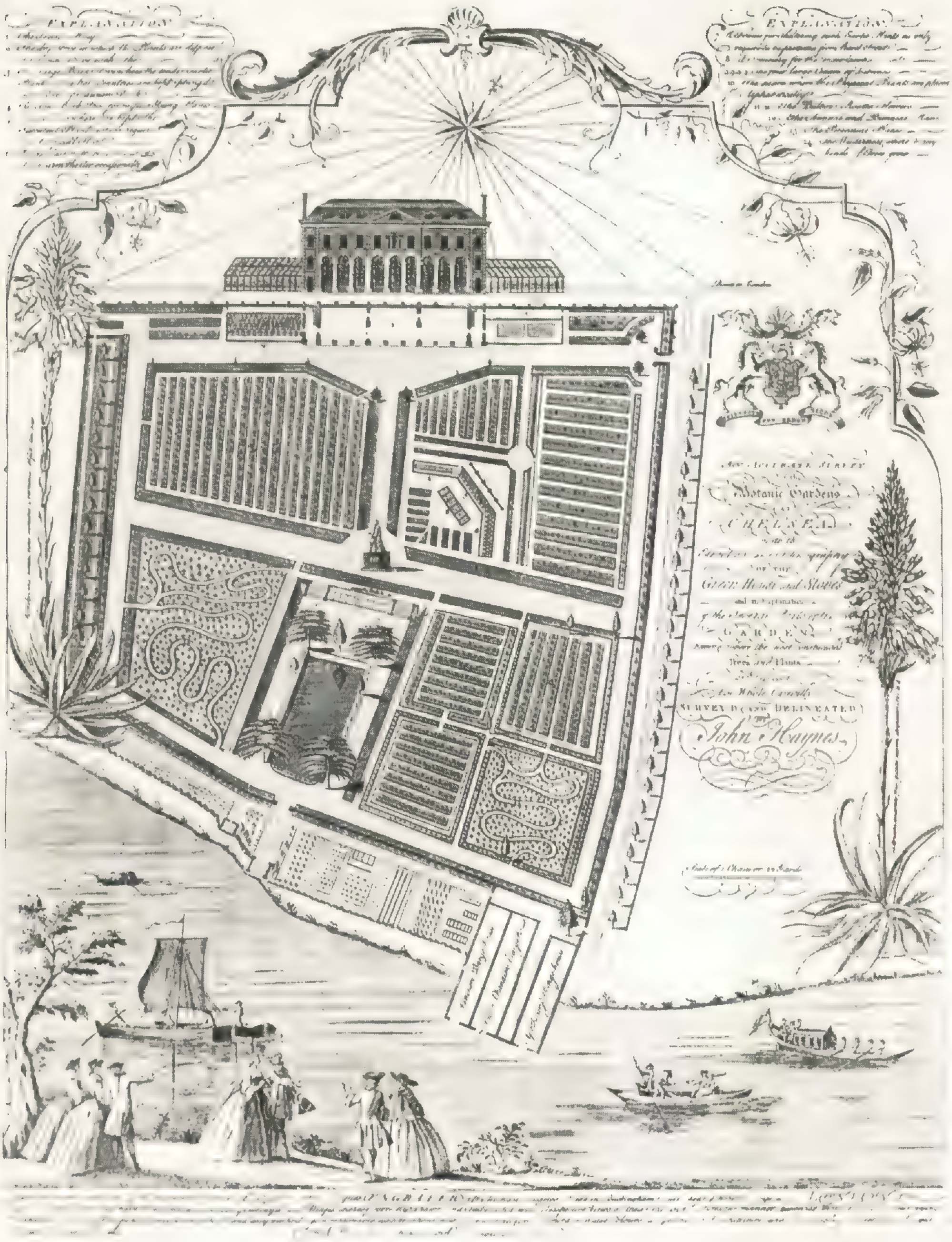

PLAN OF CHELSEA PHYSIC GARDEN BY JOHN HAYES, 1753.

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THE CHELSEA PHYSIC GARDEN

The cultivation, within small areas, of plants for their healing qualities, by the monks of the middle ages, appears to have been the beginning of modern botanical gardens, although these mediaeval gardens doubtless took their origin from others of greater antiquity. The monks being compelled to live on vegetables and fruits made the garden and its cultivation of special importance in the monastery. To the fostering care of these men and their knowledge of drugs and horticulture in general we owe a debt of greatest magnitude. With the real growth in the knowledge of plants and their uses there also grew up a mass of superstition, partly founded on old tradition, and partly no doubt invented by the herbalist and drug seller to prevent any infringement upon their monopoly in plants of real or supposed medicinal value. It was largely owing to the need of protecting the doctor and apothecary against the drug seller that the growing of "simples" in recognized gardens had its origin. As the medical profession became established in universities, these institutions set aside definite enclosures for the cultivation of medicinal herbs, the "simplicia" from which the "remedia composita" were prepared by the apothecaries. Since the universities were generally situated in towns, their physic gardens were usually small, and in various parts of Europe we may still see remains of these ancient gardens which have gradually been transformed into the botanical gardens of the present day.

In England, as early as the beginning of the sixteenth century, several private gardens devoted to the cultivation of medicinal herbs were developed, and 100 years later the Oxford Botanical Garden was completed. The first wooden greenhouses ever made were erected here, and these were

heated in severe weather by means of a four-wheeled fire basket filled with charcoal which was drawn backwards and forwards through the house by a gardener.

One of the most famous of these early gardens and one which had perhaps the greatest influence upon the development of the *materia medica* of the period was the Chelsea Physic Garden, founded by the Society of Apothecaries of London in the year 1673. The Society of Apothecaries itself was formed in 1617 "that the ignorance and rashness of presumptuous empyrics and unexpert men might be restrained whereby many discommodities, inconveniences and perils do daily arise to rude and incredulous people." The earlier garden of the Society had been at Westminster but this had no river frontage, and the grounds at Chelsea were leased as a convenient spot for building a barge house for the processional barge in which the apothecaries attended functions, as was the custom for city companies. The ground was leased from Charles Cheyne, Esq., who, under date of August 9, 1673, did "devise and grant unto the master wardens and Society of the Art and Mystery of Apothecaries of the City of London, their successors and assigns, a piece and parcel of ground and premises therein mentioned, to hold from Michaelmas then next ensuing unto the full end and term of 61 years, at a yearly rental of five pounds."

The name of the first gardener was Piggott, whose services were discontinued in 1677 and Richard Pratt was chosen to succeed him at a salary of thirty pounds per annum. In 1681 a green house, or so-called "stove," was erected adjacent to the river at a cost of 138 pounds. It is of interest to note that this house was probably one of the first to be supplied with so-called "subterranean heat," conveyed by means of a brick flue under the conservatory. At about this time four small cedar trees were planted, the first to be established in England. Two lived for a century and the third for almost two hundred years, while the last one was not removed until 1903.

A memorable date in the annals of the garden was the year 1712, when Dr. Hans Sloane, a member of the Apothecaries, purchased the Manor of Chelsea from Lord Cheyne. Two years later the garden committee met with Sloane to ascertain his views relative to the future of the garden. From this

date the activities of the garden gradually increased, and in 1722 it was formally conveyed by the owner to the Society of Apothecaries. The conveyance was made "That the said garden might at all times thereafter be continued as a Physick Garden, and for the better encouraging and enabling the said Society to support the charge thereof, for the manifestation of the power, wisdom, and glory of God in the works of creation, and that their apprentices and others might better distinguish good and useful plants from those that bore resemblance to them, and yet were hurtful, and other the like good purposes." This is strangely reminiscent of the terms of Henry Shaw's bequest of $200 to the Bishop of the Episcopal Church for an annual sermon "on the wisdom and goodness of God as shown in the growth of plants, fruits, and other products of the vegetable kingdom." Sloane further provided that if certain conditions were not fulfilled, such as "presenting fifty specimens each year of distinct plants, well dried and preserved," to the President and Fellows of the Royal Society of London, the property should pass to the Royal Society and if it refused to assume the obligation the garden was to go to the President and College of Physicians. The Apothecaries now having complete control of the garden, Philip Miller was appointed head gardener and in 1730 he published the first official list of cultivated plants in the Chelsea Garden, entitled "Catalogus Plantarum Officinalium, quae in Horto Botanico Chelseyano aluntur." This list was written in Latin with the appended English name. The arrangement followed that of Ray and was compiled under two divisions, Herbs and Undershrubs, and Trees and Shrubs. The first section included 405 plants and the second 94.

In 1732 the society spent two thousand pounds on greenhouses and in the following year erected a monument to Sir Hans Sloane, this statue by Rysbrach now occupying a central site in the garden.

A notable event of this period was a visit to the garden by the distinguished botanist Linnaeus. The high esteem in which the Chelsea garden was held by the scientific men of foreign countries is attested by the fact that Linnaeus mentions only those at Chelsea and Oxford. In his diary he states: "Miller of Chelsea permitted me to collect many plants in the garden, and gave me several dried specimens collected in South Amer-

ica.'' Philip Miller held his appointment for half a century, during which period he wrote extensively, contributing many papers to various learned societies. The standard work of that period and for many years after was Miller's Dictionary of Gardening, the first edition being published in 1724 and the seventh in 1759. Later it was translated into Dutch, German and French.

For many years the records of the garden contain nothing of general interest, though much of botanical value. In 1773 a demonstrator was appointed to lecture in the garden to students but it was not until Dr. Lindley entered upon his duties as Praefectus Horti and Professor of Botany that botany became permanently established. Johnson refers to the collecting trips of this period in the following lines, from which it is evident that something more than plants attracted these excursionists:

"Spread by direction of the generous lord,
A copious banquet loads the festive board,
And when from solid fare the guests have ceased,
With bumper cups they crown the jovial feast."

On another excursion the travelers explored the flora of Wales, and reference is made to a learned Doctor of Divinity, much interested in botany, who joined the party at Stockport only to depart the following morning. His reason, expressed in Latin upon the walls of his bedroom, stood as a warning to future travelers for many years:

"If, traveler, you seek for quiet,
An easy couch, a wholesome diet,
A landlord with a smiling mien,
A chambermaid whose face is clean,
At Stockport you will never stay
But turn your steps another way.
But if in dirt and filth your soul delights,
At Stockport you may pass some pleasant nights."

Many anecdotes are extant in reference to demonstrator Thomas Wheeler, who held the position for upwards of forty years, resigning in 1820. One, probably in connection with a "Grand Herborizing,'' is related by Mr. Hurlock, a well-known member of the Apothecaries Society. The demonstrator, accompanied by one or two other persons, was exploring some localities in Kent in search of plants for the annual

lecture. With his hat off, his thin, light hair blowing about his face, and his large spectacles on his nose, alternately laughing and chatting with the driver, and diving into his hat with his huge pocket knife, separating and examining a bunch of wild flowers, he naturally attracted attention along the road; and, when stopping at a turn-pike gate, the party was rather surprised by the evident interest and eagerness of the toll-keeper, as he scratched his head and, pointing to Mr. Wheeler, exclaimed in his blunt Kentish dialect: "So ye hae got him at last." This was incomprehensible to all the party until they arrived at a small inn close to the parish of Barming, where they read a placard offering a reward for the capture of an escaped lunatic.

In this connection, we are reminded that the late Dr. W. G. Farlow, Professor of Cryptogamic Botany at Harvard, usually carried a fish basket instead of a vasculum when botanizing, and when people asked him what he was doing, replied that he was geologizing. This was on the theory that however great a fool they might think him for hunting minerals, it was nothing to be compared to what they would think if he were hunting plants.

In 1899, the Apothecaries, being no longer disposed to maintain the garden out of their corporate funds, applied to the Charity Commissioners for a scheme which might provide for the relinquishment of their trust. After an inquiry the trustees offered to provide eight hundred pounds per year and the treasury a yearly sum of one hundred pounds out of moneys set aside by Parliament. By this scheme the trustees of the London Parochial Charities became the trustees of the garden and were charged with the care of the property and funds. A newly appointed committee held their first meeting May 11, 1899, and selected Mr. William Hayes, M. P., as chairman and Sir Owen Roberts as vice-chairman. In the following July Mr. William Hales, graduate of the Royal Botanic Gardens at Kew, was appointed as Curator and, upon the advice of Professor Farmer, six thousand pounds was spent in rebuilding and modernizing the garden. The buildings were completed and formally opened on July 25, 1902, by the Right Honorable, the Earl Cadogan, a lineal descendant of Sir Hans Sloane. In the first report, issued in 1905, under the new management, mention is made of exchanging seeds with

thirty-five botanic gardens throughout the world, the Missouri Botanical Garden being listed as the only one in America.

Because of its interest to physicians, this famous old medicinal garden will be reproduced as nearly as possible at the Missouri Botanical Garden in honor of the convention of the American Medical Association, which will be held in St. Louis during May. The plan and survey followed is that of John Hayes (see pl. 8), prepared March 30, 1753. The beds of medicinal plants will follow the arrangement of Lindley and will include some seventy-two families, 160 genera, and over 200 species. This garden has been laid out and planted by the vocational pupils of the War Veterans' Bureau, in the School for Gardening.

PLANTS IN REPLICA OF THE CHELSEA PHYSIC GARDEN
(Arranged according to Lindley)

Botanical name	Common name	Medicinal property
	POLYPODIACEAE	
Adiantum pedatum	Maidenhair fern	Pectoral, tonic, aromatic
Aspidium Felix-mas	Male fern	Pectoral, tonic, aromatic
Polystichum acrostichoides	Christmas fern	Anthelmintic
	ARACEAE	
Arisaema triphyllum	Jack-in-the-pulpit	Root—acrid, stimulant
Arisaema Dracontium	Green dragon	
	IRIDACEAE	
Iris fiorentina	Orris root	Emeto-cathartic, diuretic
	ORONTIACEAE	
Acorus Calamus	Sweet flag	Aromatic, carminative
	LILIACEAE	
Erythronium albidum	Dog's-tooth violet	Emetic, emollient
Hemerocallis fulva	Day lily	Root—cathartic; leaves—refrigerant
Allium Cepa	Onion	Stimulant, diuretic, expectorant
Asparagus officinale	Asparagus	Diuretic, arterial sedative
	DIOSCOREACEAE	
Dioscorea villosa	Wild yam	Antispasmodic, diaphoretic
	SMILACEAE	
Smilax hispida	Green briar	Root—alterative, diuretic; stem—alterative, diuretic, emmenagogue

Botanical name	Common name	Medicinal property
	PINACEAE	
Juniperus virginiana	Red cedar	Leaves—stimulant, diuretic; bark—aromatic; buds & berries—diuretic
	BETULACEAE	
Betula nigra	Red birch	Leaves & bark—aromatic, bitter; juice—antiscorbutic, anthelmintic
	ALTINGIACEAE	
Liquidambar Styraciflua	Sweet gum	Bark—nervine; flower—aromatic
	SALICACEAE	
Salix caprea	European pussy willow	Bark — astringent, antiseptic; leaves—astringent
Populus balsamifera	Balsam poplar	Bark—stimulant, diuretic
	MYRICACEAE	
Myrica asplenifolia	Sweet fern	Bark—astringent, tonic; leaves—aromatic, stimulant
	CANNABINACEAE	
Cannabis sativa	Hemp	Nervine, anodyne, sudorific
Humulus Lupulus	Hop	Tonic, diuretic, febrifuge
	EUPHORBIACEAE	
Euphorbia corollata	Flowering spurge	Root—diuretic, cathartic; juice—antisyphilitic; leaves—astringent, tonic, narcotic
Euphorbia Lathyris	Caper spurge	
Ricinus communis	Castor bean	
	CORYLLACEAE	
Quercus palustris	Pin oak	Bark—astringent, tonic, antiseptic, bitter, febrifuge
Quercus rubra	Red oak	
Quercus coccinea	Scarlet oak	
Fagus sylvatica	Beech	
	JUGLANDACEAE	
Juglans nigra	Black walnut	Bark—astringent, tonic, alterative, cathartic; juice—herpetic;
Juglans cinerea	Butternut	
Carya cordiformis	Bitternut	Bark—acrid, astringent; leaves—astringent
	MENISPERMACEAE	
Menispermum canadense	Moonseed	Excitant, tonic, laxative
	CUCURBITACEAE	
Mormordica balsamifera	Balsam apple	Purgative, emetic, acrid

Botanical name	Common name	Medicinal property
	VIOLACEAE	
Viola odorata	Sweet violet	Emetic, cathartic, vulnerary
Viola pedata	Bird's-foot violet	
Viola cucullata	Common blue violet	
Viola striata	White violet	
	BRASSICACEAE	
Brassica nigra	Black mustard	Seed—pungent, laxative, stimulant
Radicula Armoriacia	Horseradish	Depurative, stimulant, diuretic
	MALVACEAE	
Althaea officinalis	Marsh mallow	Demulcent, emollient
Gossypium herbaceum	Cotton	Anti-venomous, emollient
	SAPINDACEAE	
Cardiospermum Halicacabum	Balloon vine	Sudorific, diuretic
Aesculus Pavia	Red buckeye	Bark—tonic, febrifuge; seed—poisonous, like strychnine
	HYPERICACEAE	
Hypericum perfoliatum	St. John's wort	Aromatic, bitter, astringent
	MAGNOLIACEAE	
Magnolia glauca	Sweet bay	Tonic, astringent, stimulant
Magnolia acuminata	Cucumber tree	
Liriodendron Tulipifera	Tulip tree	Bitter, aromatic, antirheumatic
	RANUNCULACEAE	
Clematis erecta	Clematis	Irritant, vesicant, diuretic
Hepatica acutiloba	Liver-leaf	Hepatic, astringent, pectoral
Hydrastis canadensis	Golden-seal	Tonic, antiperiodic, laxative
Ranunculus bulbosus	Bulbous buttercup	Rubefacient, vesicant
Aconitum Anthora	Aconite	Narcotic, arterial sedative
Paeonia officinalis	Peony	Seeds—cathartic, emetic; root—antispasmodic
Cimicifuga racemosa	Black cohosh	Alterative, nervine
Actaea alba	White baneberry	Emetic, purgative, astringent, vulnerary
Podophyllum peltatum	May apple	Cathartic, resolvent, emetic
Delphinium consolida	Larkspur	Diuretic, vermifuge, vulnerary
	PAPAVERACEAE	
Chelidonium majus	Celandine	Hydragogue, aperient, diuretic
Sanguinaria canadensis	Bloodroot	Emetic, sedative, diuretic
Argemone mexicana	Prickly poppy	Anodyne, diuretic, emetic; seed—opthalmic

Botanical name	Common name	Medicinal property
	FUMARIACEAE	
Dicentra canadensis	Dutchman's breeches	Antisyphilitic, alterative, diuretic, tonic
	BERBERIDACEAE	
Caulophyllum thalictroides	Blue cohosh	Stimulant, emmenagogue, sudorific
Berberis vulgaris	Barberry	Root & bark—astringent, laxative, hepatic; buds—acid, refrigerant
	VITACEAE	
Vitis vinifera	Grape	Acid, refrigerant, antiscorbutic
	MELIACEAE	
Melia Azedarach	Melia	Bark & root—anthelmintic, vermifuge
	ANACARDIACEAE	
Rhus toxidendron	Poison ivy	Rubefacient, vesicant
	RUTACEAE	
Ptelea trifoliata	Hop tree	Tonic, stimulant, alterative
Ruta graveolens	Rue	Antispasmodic, emmenagogue
	XANTHOXYLACEAE	
Xanthoxylum americanum	Prickly ash	Pungent, tonic, stimulant, alterative
	LINACEAE	
Linum usitatissimum	Flax	Pectoral, demulcent, emollient, mucilaginous
	OXALIDACEAE	
Oxalis corniculata	Sorrel	Acrid, refrigerant, diuretic, astringent
Oxalis violacea	Wood sorrel	
	GERANIACEAE	
Geranium maculatum	Wild cranesbill	Astringent, tonic, styptic, antiseptic
Geranium sanguineum	Cranesbill	
	CARYOPHYLLACEAE	
Saponaria officinalis	Bouncing Bet	Tonic, diaphoretic, alterative, saponaceous
	POLYGONACEAE	
Rheum Rhaponticum	Rhubarb	Root—cathartic, astringent, tonic
Rumex Acetosella	Field sorrel	Leaves—acid, diuretic; root—astringent, tonic
Polygonum hydropiperoides	Smartweed	Astringent, vulnerary, antiseptic

Botanical name	Common name	Medicinal property
	PHYTOLACCACEAE	
Phytolacca decandra	Pokeweed	Alterative, resolvent, deobstruent, detersive
	CHENOPODIACEAE	
Chenopodium Botrys	Jerusalem oak	Leaves — antiscorbutic, anthelmintic, narcotic; herb & fruit —anthelmintic
Chenopodium ambrosioides	Mexican tea	
	LAURACEAE	
Sassafras officinale	Sassafras	Aromatic, stimulant
Lindera Benzoin	Spicebush	Twigs—aromatic, vermifuge; fruit—spicy
	FABACEAE	
Baptisia tinctoria	False indigo	Alterative, antiseptic
Cytisus scoparius	Broom	Leaves—emetic, purgative; seeds —emetic
Glycyrrhiza glabra	Licorice	Demulcent, pectoral
Tephrosia virginiana	Hoary pea	Antisyphilitic, vermifuge
Robinia Pseudacacia	Black locust	Emetic, cathartic, tonic
Cassia marylandica	Wild senna	Cathartic, vermifuge, diuretic, antisyphilitic
	ROSACEAE	
Rubus villosus	Dewberry	Fruit—febrifuge, diuretic; plant & flowers—diuretic; leaves—astringent, purgative
Rubus canadensis	Blackberry	
Fragaria vesca	Strawberry	Astringent, diuretic
Geum virginicum	Avens	Astringent, styptic, tonic
Spiraea Filipendula	Queen of the meadow	Astringent, tonic, diuretic
Spiraea tomentosa	Hardhack	
Gillenia stipulacea	American ipecac	Emetic, cathartic, sudorific, tonic
	DRUPACEAE	
Prunus serotina	Wild black cherry	Fruit—acid, astringent; bark—tonic, stimulant, sedative
	POMACEAE	
Pyrus Malus	Apple	Fruit—acid, astringent; bark—tonic, detergent
	SAXIFRAGACEAE	
Heuchera americana	Alum root	Astringent

Botanical name	Common name	Medicinal property
	LYTHRACEAE	
Lythrum Salicaria	Loosestrife	Astringent, mucilaginous, anti-syphilitic, demulcent
	ULMACEAE	
Ulmus fulva	Slippery elm	Bark—expectorant, diuretic, astringent, tonic; leaves—vulnerary
	RHAMNACEAE	
Rhamnus cathartica	Buckthorn	Laxative, purgative, depurative
Rhamnus Purshiana	Cascara sagrada	
Ceanothus americanus	New Jersey tea	Astringent, expectorant, stimulant
	CELASTRACEAE	
Celastrus scandens	False bittersweet	Alterative, diuretic, herpetic, narcotic
Evonymus atropurpurea	Wahoo	Bark—tonic, laxative, alterative, diuretic, expectorant; seed—cathartic
Evonymus americana	Strawberry-bush	
Evonymus obovata	Strawberry-bush	
Evonymus europaea	Spindle tree	
	EBENACEAE	
Diospyros virginiana	Persimmon	Bark—astringent, febrifuge; fruit—astringent
	AQUIFOLIACEAE	
Ilex opaca	American holly	Leaves—astringent, tonic, antiseptic; fruit—emetic, tonic
	APOCYNACEAE	
Apocynum cannabinum	Dogbane	Emetic, cathartic, diuretic
Apocynum androsaemifolium	Spreading dogbane	
	OLEACEAE	
Chionanthus virginica	White fringe	Aperient, alterative
Ligustrum vulgare	Privet	Leaves — astringent; fruit—cathartic
Syringa vulgaris	Lilac	Febrifuge
	SOLANACEAE	
Solanum Dulcamara	Bittersweet	Narcotic, anodyne, depurative
Atropa Belladonna	Belladonna	Narcotic, diaphoretic, diuretic
Datura Stramonium	Jimson weed	Stimulant, sedative
Datura Tatula	Jimson weed	
Nicotiana Tabacum	Tobacco	Narcotic, sedative, emetic
Capsicum annuum	Red pepper	Stimulant, stomachic

Botanical name	Common name	Medicinal property
	ASCLEPIADACEAE	
Asclepias tuberosa	Butterfly weed	Expectorant, diuretic, diaphoretic, tonic, carminative
Asclepias syriaca	Silkweed	
Asclepias incarnata	Swamp milkweed	
	CONVOLVULACEAE	
Ipomoea pandurata	Wild potato vine	Root—laxative, diuretic, hydragogue
	PLUMBAGINACEAE	
Statice caroliniana	Sea lavender	Astringent, tonic
	BORAGINACEAE	
Cynoglossum officinale	Hound's tongue	Plant—astringent, aromatic; root—tonic, diuretic
Borago officinalis	Borage	Sudorific, demulcent
	LAMIACEAE	
Lavandula vera	Lavender	Bitter, pungent, aromatic
Mentha spicata	Spearmint	Stimulant, stomachic, diuretic
Mentha piperita	Peppermint	
Salvia officinalis	Sage	Tonic, pectorant, aromatic
Cunila origanoides	Dittany	Stimulant, nervine
Marrubium vulgare	Horehound	Aromatic, expectorant
Nepeta Cataria	Catnip	Aromatic, diaphoretic, diuretic, anodyne
	SCROPHULARIACEAE	
Scrophularia marilandica	Figwort	Alterative, diuretic
Chelone glabra	Turtle-head	Tonic, cathartic, hepatic
Digitalis purpurea	Foxglove	Diuretic, emetic, vulnerary
	LOBELIACEAE	
Lobelia inflata	Indian tobacco	Anthelmintic, antispasmodic, nervine
Lobelia syphilitica	Large blue lobelia	
	ASTERACEAE	
Liatris squarrosa	Blazing-star	Diuretic, stimulant
Eupatorium perfoliatum	Boneset	Aromatic, tonic, diuretic, antispasmodic
Eupatorium purpureum	Joe-Pye weed	
Erigeron annuus	Fleabane	Astringent, tonic
Solidago odora	Golden-rod	Vulnerary, diuretic
Inula Helenium	Elecampane	Expectorant, emollient
Helenium autumnale	Sneezeweed	Tonic, febrifuge
Achillea Millefolium	Yarrow	Astringent, alterative
Artemisia Absinthimum	Absinth	Aromatic, tonic, diuretic
Tanacetum vulgare	Tansy	Aromatic, tonic

Botanical name	Common name	Medicinal property
Antennaria plantaginifolia	Plantain-leaved antennaria	Pectoral, diuretic
Lappa major	Burdock	Alterative, diuretic
Taraxacum Dens-leonis	Dandelion	Stomachic, tonic, diuretic
Lactuca sativa	Lettuce	Anti-venomous, sedative, narcotic
ONAGRACEAE		
Oenothera biennis	Evening primrose	Mucilaginous, acrid, exanthematous
CINCHONACEAE		
Cephalanthus occidentalis	Buttonbush	Tonic, aperient, diuretic, febrifuge
APIACEAE		
Petroselinum sativum	Parsley	Diuretic
Carum Carvi	Caraway	Carminative, stomachic
Pimpinella Anisum	Anise	Aromatic, stimulant
Foeniculum officinale	Fennel	Carminative, stimulant
Heracleum lanatum	Cow parsnip	Stimulant, carminative
Coriandrum sativum	Coriander	Aromatic, carminative
Conium maculatum	Poison hemlock	Narcotic, anodyne
Daucus Carota	Carrot	Roots & seeds—stimulant, diuretic, carminative
ARALIACEAE		
Panax quinquefolia	Ginseng	Leaves—soporific; root—aromatic, stimulant; bark—aromatic, stimulant
Aralia spinosa	Hercules' club	
Aralia racemosa	Spikenard	
Hedera Helix	English ivy	Astringent, purgative, emetic
CORNACEAE		
Cornus florida	Flowering dogwood	Bark—astringent, tonic, febrifuge; flower—uterine tonic
Cornus sericea	Silky cornel	
Cornus circinata	Round-leaved cornel	
HAMAMELIDACEAE		
Hamamelis virginica	Witch-hazel	Bark & leaves—astringent, tonic, sedative, vulnerary
ARISTOLOCHIACEAE		
Asarum canadense	Wild ginger	Root—aromatic, stimulant
Aristolochia Serpentaria	Virginia snakeroot	Root—stimulant, tonic, diuretic
Aristolochia tomentosa	Dutchman's pipe	

HERBALS

The utilitarian side of botany had its inception in its application to medicine. Various plants, from the earliest times, had been used as healing agents, and it became necessary to study them in order to recognize the kinds employed for the cure of different diseases. The herbalists' knowledge was of course in the first place transmitted entirely by word of mouth, but as time went on oral tradition was replaced by the written record.

The Materia Medica of Dioscorides, a manuscript copy of which is at Vienna, is the earliest extant European work dealing with medicinal plants. This manuscript is illustrated by drawings which in some cases are remarkably accurate and beautiful. After the invention of printing, many of the works which had previously existed only in manuscript form were put into type cotemporaneously with books actually written at the time. Consequently the so-called *incunabula* of the fifteenth century are far older as regards the matter they contain than the date of their publication would seem to indicate.

The library of the Missouri Botanical Garden is particularly fortunate in having a remarkably complete collection of natural histories and medical botanies printed before the time of Linnaeus. These works are of the utmost value in tracing the history of plants, but they likewise throw considerable light upon the development of science in general, particularly medicine. Some of the more important of these pre-Linnaean publications have been brought together in the old museum building at the Garden and will be on exhibition during the meeting of the American Medical Association. Included in this exhibition are the following works:

1. *Herbarius Latinus* (also known as *Herbarius in Latino, Herbarius Moguntinus, Herbarius Patavinus, the Latin Herbarius*, etc.), Meinz, 1848, by Peter Schoeffer, contains fifteen illustrated chapters on herbs and their virtues, as well as an index to ninety-six drugs. It is interesting to note that only thirty years previous to the publication of this work the first book from movable type was produced in the same town of Meinz. So far as known this is the only copy of the *editio princeps* in America. It is a larger copy than that in the

British Museum and much finer than the inferior reprinting of this work in the Morgan library.

2. *Macer Floridus*, Paris, about 1490, Aemilius Macer is of course not the author of the book, only the advertising title of a rythmical herbal of probably Salernitan origin supposed to date back to the tenth century. The virtues of seventy-seven plants are described in mediaeval Latin verse. The Morgan Library and the Surgeon General's library both contain mutilated copies of this work, but the Garden copy is probably the only perfect one in this country.

3. *Hortus Sanitatis*, Meinz, 1491, is probably derived from pre-existing so-called "herbariums." It depicts the powers and virtues of 435 plants, together with other things commonly found in apothecary shops including birds, fishes, and stones. It is rich in pictures, only about one-third of which are new, the rest copied on a reduced scale from a work which appeared in 1495. Some of the illustrations are of mythical animals, such as the unicorn, phoenix, man and the hydra. and the harpy with its claws in a man's body.

4. *"Herbarium"* of Otto Brunfels, 1530. A new era in the history of herbals may be said to date from this year, when the first part of Brunfels' work was published by Schott of Strasbourg. The book is notable for its beautiful and natural depiction of plants which are not represented in the conventionalized aspect which had become traditional in the earlier herbals. To quote from the book itself: "Lively figures of plants drawn after nature with the utmost care and art, together with their effects, in aid of the old and now reviving science of botanical medicine."

5. *"Herbarium"* of Hieronymus Bock, first edition, 1539, second edition, 1546. Contain many woodcuts drawn by a young self-taught artist, David Kandel. The woodcuts are notable for the humor displayed in introducing accessory figures of men and animals with the plants. Bock was extremely free from the credulity which influenced the works of many of the earlier botanists and did not hesitate to express his scorn at the "monkey tricks and ceremonies associated with the use of plants collected for the purposes of magic rather than for medicine."

6. *"Herbarium"* of Leonhard Fuchs appeared first in Latin in 1542, followed by a German edition the next year under the title New Kreuterbuch. Fuchs was a contemporary of Brunfels and Bock and was in great demand as a physician and teacher. Part of his professional reputation was based upon his successful treatment of an epidemic which swept over Germany in 1529, and a little book of medical instruction and prayers against the plague, published in London fifty years later, was supposed to have embodied the practice of Fuchs. The woodcuts of Fuchs' herbal are accurate and of great beauty. Indian corn and the pumpkin are here illustrated for the first time.

7. *Historia plantarum* of Conrad Gesner, 1541. Gesner wrote on medicine, mineralogy, zoology, and botany, as well as linguistic subjects, but up to the time of his death had published little. He founded a new school of botanical illustration, collecting some 1500 drawings notable for the great detail of flower and fruit structure as well as natural habit of the plant depicted. These were not published until 150 years after his death.

8. *"Herbarium"* of Matthiolus, 1554. The success of this work was phenomenal, some 32,000 copies of the earlier editions being sold. Later editions are notable for the large and beautiful illustrations contained.

9. *Simplicium medicamentorum*, by Nicholaus Monardes, 1575. Monardes was a Spanish physician and his work is chiefly an account of plants brought from the West Indies. In the edition which was translated into English in 1577, his sub-title reads: "Joyfull newes out of the newe found world." Among other things he gives a long account of the virtue of the tobacco plant.

10. *The herball or generall historie of plants* of John Gerarde, 1597. Gerarde aimed at conveying information in simple language, as, for instance, he speaks of a preparation being "squirted into the eyes." He apologizes for the colloquialism, explaining that he does not wish to be "overeloquent among gentlewomen, unto whom especially my works are most necessary."

11. *Pinax theatris botanici* of Gaspard Bauhin, 1623, contains the first complete concordance of names of plants dealing with about 6,000 species, and is even yet indispensable for the history of individual species.

12. *Paradisi in Sole* by John Parkinson, London, 1629. In 1640 Parkinson followed this work with a much larger volume entitled "The theatre of plants or An herbal of a large extent." The virtues of herbs were dealt with in great detail, although not infrequently he displays an imagination truly mediaeval.

Contemporaneous with the herbals of the sixteenth and seventeenth centuries there appeared a series of books devoted to the superstitions with which herb collecting was associated. These centered about the so-called "doctrine of signatures" and astrological botany, giving attention to the dangers attending the collection of certain plants such as the mandrake. That the writers themselves did not altogether believe everything printed is evidenced by one who naively remarked concerning certain notions and observations recorded: "most of which I am confident are true and if there be any that are not so, yet they are very pleasant." One of the most famous of these writers was Philippus Aeroulius Theophrastus Bombastus, better known by the name of Paracelsus (1493-1541). He was a physician who contemptuously disregarded the work of all physicians who had preceded him by burning their writings. Browning's poem gives perhaps the best outline of his career. The virtues of plants, according to Paracelsus, depended upon their containing the three fundamental principles of sulphur, salt, and mercury, and he believed that most medicinal herbs were signed with a clear indication of their uses. To quote: "I have ofttimes declared how by the outward shapes and qualities of things we may know their inward virtues which God hath put in them for the good of man, so in St. John's wort we may take notice of the form of the leaves and flowers; the porosity of the leaves and the veins. The porosities or holes in the leaves signify to us that this herb helps both inward or outward holes or cuts in the skin, and the flowers of St. John's wort when they are purified are like blood, which teaches us that this herb is good for wounds, to close them and fill them up."

13. *The Phytognomonica.* Giambattista Porta. Naples, 1588. It has been held that Porta, who was born a short time before the death of Paracelsus, is to be regarded as the real founder of the doctrine of signatures. He certainly developed the theory to the fullest extent, pointing out the most obscure resemblances between flowers and fruits and the limbs and organs of animals.

14. *Adam in Eden.* William Coles. Oxford, 1657. This herbalist of the seventeenth century made the doctrine of signatures peculiarly his own. Coles at least attempted to follow his theories to their logical conclusion. Commenting upon the large number of plants with medicinal virtues that possess no obvious signature, he concludes that these were purposely left blank by the Almighty in order to encourage man's skill in discovering the properties of the plant for himself. He adds that if all were signed "the rarity of it, which is the delight, would be taken away by too much harping upon one string."

Recalling the position which astrology had come to occupy in the middle ages it is but natural that the influence of the heavenly bodies should have been applied to plants.

15. *"The book of secrets on the virtues of herbs, plants, and certain beasts"* Albertus Magnus. Many references to botanical astrology are to be found in this work. For instance we are told that "if the marigold be gathered the sun being in the sign of Leo and be wrapped in the leaf of a laurel, and a wolf's tooth be added thereto, no man shall be able to have a word to speak against the bearer thereof but words of peace." Concerning the plantain we read: "The root of this herb is marvelous good against the pain of the head because the sign of the ram is supposed to be the house of the planet Mars which is the head of the whole world."

16. *"Astrological botany."* Leonhardt Thurneysser zum Thurn. Berlin, 1578. The writer of this extraordinary book was a charlatan of the first order, having to leave the country when he was detected selling gilded lead as a substitute for gold. He practiced medicine and sold amulets and talismans at great profit. He projected a great botanical work in ten volumes, owning a printing press and employing a large staff

of artists and engravers. The first volume, a copy of which is shown, is the only one published. Plants were described according to their qualities, either male or female, with a third class typified by a child symbolizing feeble effects. The following translation from the preface illustrates the style of the work. Discussing the planting of roots and herbs and the gathering of seed he says: "It is absolutely essential that these operations should be performed so as to correspond with the stations and positions of the planets and heavenly bodies, to whose control diseases are properly subject, and against diseases we have to employ herbs, with due regard, of course, to the sex, whichever it be, of human beings, and so herbs intended to benefit the male sex should be procured when the sun or moon is in some male sign, for example Sagittarius or Aquarius, but if this be impossible, at least when they are in Leo. Similarly herbs intended to benefit women should be gathered under some female sign, Virgo, or if that is impossible, under Taurus or Cancer."

SOME PROBLEMS AND EXHIBITS IN PLANT PATHOLOGY

Important Diseases of Plants Induced by Filterable Viruses.—Variegation and chlorosis in plants are common phenomena. Some variegated foliage (using variegation in this account to indicate green leaves which are blotched, mottled, striped, or edged with white or yellow) are characteristic of established or "natural" ornamental varieties of cultivated plants. Other types of variegation are infectious from a very slight to a very high degree.

Of the infectious types of variegation or mottling the "mosaic" diseases are among the most disastrous, these being diseases even in the popular sense,—causing injury and often great loss to cultivated crops. The mosaic disease of tobacco, often known as "calico," is one of the most common of these maladies and is a disease widely distributed throughout the world. It is highly infectious, through the stings and bites of insects, and is readily transferred by mechanical or other artificial means. It has been definitely shown that this disease is caused by a "filterable virus," that is, a disease, the infective particles of which will pass the pores of the usual porcelain bacteriological filters.

Experiments conducted in the Missouri Botanical Garden have shown that by employing a series of filters of differing porosity it is possible to determine with porcelain filters, in relation to the sizes of the pores, the approximate diameter of this infective agency which has thus far been designated merely as a filterable virus. Employing various colloidal substances, the approximate diameter of whose particles are known as a result of ultra-microscopic investigation, it is possible to choose a colloid which has filtration relations similar to that of the infective agency of the mosaic disease. Some elaborate experiments in this direction have yielded the result that the sizes of the infective particles of the tobacco mosaic are about 30 $\mu\mu$, or 0.03 μ, corresponding very closely to the sizes of the particles of hemoglobin in solution.

Experiments will be exhibited in the experimental greenhouses, showing the results of inoculation with this virus of the tobacco filtered through different bacteriological filters. the pore sizes of which have been standardized by employing colloidal solutions mentioned above.

Again, experiments will be exhibited showing the comparatively slight effect on the disease agency of dehydrating rapidly diseased tissues of the tobacco by employing absolute alcohol and acetone, then employing infusions of these dehydrated tissues in the inoculation of the host. The disease "agency" possesses a remarkable power of resistance against such reagents, contrasting strongly with the average plant or animal cell.

Other mosaic diseases of cultivated plants will be shown, such as those of sugar cane, columbine, sweet-potato, poke weed, etc., that may be prevalent in the greenhouse or garden at this season. Mosaic diseases are a source of great loss to growers of beans, cucumbers, potatoes, corn, peppers and other crops.

In contrast with these mosaic diseases there will be exhibited a few types of variegation and chlorosis of ornamental plants, some of which have been demonstrated to be infectious through grafting and some of which have thus far given no indication of infectiousness. The infectious diesases of this type are believed to be caused also by filterable viruses. They differ chiefly then from the true "mosaic" diseases in that the transfer of infection must be by means of the insertion

of a diseased bud or scion. They are almost invariably transmissible by cuttings and sometimes by the seed. One of the most destructive diseases of the peach in northern latitudes, peach yellows, is likewise transferable only by budding and grafting. Since no organism has been identifiable as causally related to the peach yellows, and since the chief symptom of the disease is a chlorosis, this disease is also tentatively grouped in the "variegation" or "chlorosis" category.

Among the ornamental plants showing variegation will be included Evonymus, Ligustrum, and Abutilon.

Plant Cancer or Crown-Gall of Plants.—The most interesting bacterial disease of plants is generally conceded to be that known as crown-gall or plant cancer. It is induced by a tumor-producing organism, *Pseudomonas tumefaciens*. The attention of medical men has been directed to this plant disease particularly through some striking analogies to human cancer as revealed more especially through the elaborate investigations of Doctor Erwin F. Smith, of the Bureau of Plant Industry, Washington, D. C. Doctor Smith has demonstrated that from the primary tumors produced by the bacteria, there originate certain infection strands, and these are pictured as growing through the tissues of the host, inducing secondary tumor formation at greater or less distances from the primary infection. It is also believed that in a case where the primary infection is that of a stem and the invading strand enters a leaf, stem tissue will be produced in this secondary area. The causal bacterium is able to infect a great variety of host plants and frequently produces on apples, grapes, raspberries, and a variety of other cultivated plants certain characteristic swellings, usually at the base of the stem on the so-called crown; hence the name crown-gall. The inoculations on Paris daisy, geranium, and tobacco will show, however, as is now well known, that aerial tumors are readily produced. Inoculated into the growing meristem of certain plants, such as the tobacco, characteristic "embryomata" are induced.

A Bacterial Disease of Cereals and Other Grasses.—A new bacterial disease of grasses and cereals has recently been studied in detail by Mr. H. R. Rosen, and some infection experiments showing the lesions and the course of this dis-

ease as it affects seedlings will be exhibited. The disease was first found in Arkansas on fox-tail, but many susceptible hosts have been found among the Gramineae, especially in seedling stages. The disease is more prevalent under moist, warm conditions.

NOTES

A party of about 120 Knight Templars from Kansas City, en route to the convention at Memphis, visited the Garden April 22 and were shown about the grounds by special guides.

Dr. J. M. Greenman, Curator of the Herbarium, recently returned from an extended botanical expedition through Central America.

Dr. Herman von Schrenk, Pathologist to the Garden, has recently returned from an exploring trip to San Domingo, bringing back with him a collection of dried plants and seeds.

Mr. G. H. Pring, Horticulturist to the Garden, spoke before the Women's Club of Carlinville, Illinois, April 20, on "The Landscape Features of the Missouri Botanical Garden."

Mr. G. H. Pring, Horticulturist to the Garden, Mr. L. P. Jensen, Arboriculturist, and Mr. Paul A. Kohl, Floriculturist, attended the National Flower Show at Indianapolis, March 25-April 1.

A party of about thirty faculty and students from the University of Illinois Library School visited the Garden library, April 20, during their annual tour of the libraries and related institutions of St. Louis.

Dr. Hermann von Schrenk spoke before the engineering societies at the Engineering Building, New York, March 22, on "Destruction of Marine Piling." He also gave an address before the conservation section of the Missouri Federation of Women's Clubs, April 20, on "Forestry in Missouri."

The following lectures have been given recently by Mr. L. P. Jensen, Arboriculturist to the Garden: "The Preservation of Wild Flowers," before the Junior High School Parents-Teachers' Association, Belleville, Illinois, March 28; "American Parks and Gardens," before the Danish Silver Cross Society, April 1; "The Value of Trees," on Arbor Day,

April 7, before the graduating class of the Blair School in St. Louis Park, at the planting of their class tree, and before the North St. Louis Business Men's Association preceding memorial tree planting in the Waterworks Park at the Chain of Rocks.

STATISTICAL INFORMATION FOR MARCH, 1922

GARDEN ATTENDANCE:

Total number of visitors..... 11,957

PLANT ACCESSIONS:

Total number of seed packets received in exchange.... 417
Total number of plants received in exchange..... 4

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought..... 8
Total number of books and pamphlets donated..... 76

HERBARIUM ACCESSIONS for January, February and March, 1922:

By Gift—

Burke, Dr. R. P.—Clavariae of Alabama..... 2
Hibbard, Miss A.—*Tremellodendron Hibbardi* Lloyd from type locality and *Craterellus cornucopioides* L. 2
Humphrey, C. J.—*Polyporus Ellisianus* from Montana 1
Mitchell, Miss Willie—Marine algae from Swampscott, Massachusetts. 12
Overholts, Dr. L. O.—*Stereum albobadium* from Georgia. 1
Rosen, H. R. —*Puccinia Windsoriae*..... 1
Shear, Dr. C. L.—*Pezizella Lythri* (Desm.) Shear & Dodge. 15
Thaxter, Dr. R.—*Septobasidium frustulosum* from Trinidad. 1
Thaxter, Dr. R.—*Cyphella* sp. from Bermuda..... 1
van der Bijl, P. A.—Fungi of South Africa..... 11
White, R. P.—Species of Stereum from New York.... 6

By Exchange—

Dodge, Dr. C. W.—Fungi of British Columbia..... 16
Farlow Herbarium of Harvard University—Reliquiae Farlowianae 600
Haynes, Miss Caroline C.—North American Hepaticae 50

New York Botanical Garden—Mosses, chiefly of North America.	260
University of Wisconsin Herbarium, by Dr. Davis—Fungi Wisconsinenses Exsiccati, Dec. 9 & 10.	20
By Purchase—	
Bartholomew, E.—"North American Uredinales," Cent. 26-27.	200
Bush, B. F.—Plants of Missouri and Oklahoma.	380
Davis, Rev. John—Plants, chiefly of northeastern Missouri.	1,045
Holzinger, John M.—"Musci Acrocarpi Boreali-Americani," Fasc. 18, Nos. 426-450.	25
Weigel, Theo. Oswald—"Hayek's Centaurea exsiccati criticae," Fasc. III, Nos. 101-140.	40
Total.	2,689

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The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

STAFF
OF THE MISSOURI BOTANICAL GARDEN

Director,

GEORGE T. MOORE.

BENJAMIN MINGE DUGGAR,
Physiologist in charge of Graduate Laboratory.

EDWARD A. BURT,
Mycologist and Librarian.

HERMANN VON SCHRENK,
Pathologist.

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W. F. LANGAN,
Engineer.

H. VALLENTINE,
Construction.

Missouri Botanical Garden Bulletin

Vol. X MAY, 1922 No. 5

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ST. LOUIS, MO.
1922

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HEDYCHIUM GARDNERIANUM

Missouri Botanical Garden Bulletin

Vol. X St. Louis, Mo., May, 1922 No. 5

THE GINGER LILY

The ginger lily (*Hedychium Gardnerianum*), likewise known as the butterfly lily and the garland lily, is an ornamental plant belonging to the ginger family. The genus embraces upwards of forty species indigenous to the tropics. They are notable for their showy, white, yellow, or red flowers appearing upon dense spikes terminating the canna-like growths. In general habit the hedychiums are strong-growing plants very ornamental in flower, fruit, and foliage. Despite the fact that some of the species were introduced over a hundred years ago, they are rarely seen except in tropical greenhouses in large exotic collections such as are maintained at the Missouri Botanical Garden.

Hedychium Gardnerianum was first introduced into England from India in 1823 by Dr. Wallich who discovered it in Nepal, along the valley of Katmandu. Later it was found by Dr. Joseph Hooker in the Sikkim Himalayas and Khasia Mountains at an elevation of 4,000 and 7,000 feet. Dr. Wallich, in his monograph of Hedychium, mentions this species as the queen of the genus if not of the entire order, owing to its general aspect, nature of foliage, exquisite elegance, and fragrance of flowers. Dr. Hooker was likewise impressed with the plant, and questioned whether there was an orchid under cultivation which exceeded it in any respect. This species was named in honor of Hon. Edward Gardner, who was a resident of Nepal and representative of the East India Company. He was instrumental in augmenting the plant collection of the Calcutta Botanic Gardens and through it the gardens and herbaria of Europe.

The ginger lily was much admired when in bloom in the aroid house at the Garden last August and September. Its present growth and size of bloom compare favorably with plants seen in the tropics, being more than double the size of the plants grown in pots in the old greenhouses. The branches are five feet in length, somewhat pendant. The canna-like leaves are sessile, one and one-half feet long and six inches wide. The flower spikes each produced upwards of fifty light yellow flowers conspicuous by the long projected filament and anther which extend beyond the crowded flowers. When mature the three-chambered pod opens by the splitting and folding back of the triangular lobes. The fruit is also notable for its coloration, the lobes and central column of the seed pod being orange, while the closely attached seed surrounding the column are dark red. The roots or rhizomes are similar to those of the common ginger and are said to be used as a substitute.

THE AMERICAN SYCAMORE

A notable specimen of our native sycamore (*Platanus occidentalis*) is growing in the vicinity of St. Louis on the old Grant farm, the private estate of Mr. August A. Busch. It is located adjacent to the Gravois Creek about 400 feet north of Gravois Road and about 75 feet from the Grant Road. This stately specimen is over 100 feet high, with a spread of 80 feet, and the trunk measures 13 feet 6 inches in circumference three feet from the ground. An enormous side branch growing from the basal portion of the trunk gives the tree an unusually striking shape. Unlike the sycamores of our city streets and parkways, which at various times have been pruned to desired shapes, this specimen has been left to the care of Nature, and with age has grown to enormous size without much regard for symmetry. Apart from its size, the tree is interesting from a historical standpoint, as it must have at one time furnished shade for General Ulysses S. Grant.

The sycamore is readily distinguished from other associated trees by the strange crazy-patchwork on its branches, which in colors of dull olive and dingy white may be seen from some distance in winter. Another characteristic feature

is the gray balls or seed pods hanging from the twigs. During summer the thickest foliage rarely conceals the scarred trunk and excoriated branches splotched as if with whitewash to the top. Moulting is a continuous performance during the growing season, and even during the winter flakes of bark may be picked up around the surface roots. The tree seems utterly lacking in the power to stretch its bark fibers and fill in the chinks to fit the growing limbs. Instead, with the first rift, sycamore bark loosens, separates, and falls, leaving only the inner layers between the tender cambium and the cold atmosphere.

The fact that the sycamore will withstand the smoke nuisance so detrimental to plant life makes it a desirable city shade tree. John Parkinson, writing of the European plane tree in "Apothecarye of London," in 1840, refers to the early use of the sycamore as a street tree: "They are planted by the waysides and in market places for the shadows' sake only." Certain venerable European sycamores, according to Julia Ellen Rogers, are estimated to be 4,000 years old. They measure as much as 40 feet in trunk diameter, but are so perforated by decay that it is impossible to count the annual rings, even when the tree falls. Very few trees attain a greater age. Some people object to the use of sycamores as a street tree because during the unfolding of the leaves a fuzzy covering of branched hairs is cast off which is supposed to be irritating to the mucous membrane of the eyes and throat. However, this moulting period is so short that it is often unnoticed by those who have lived in the neighborhood of sycamores for years.

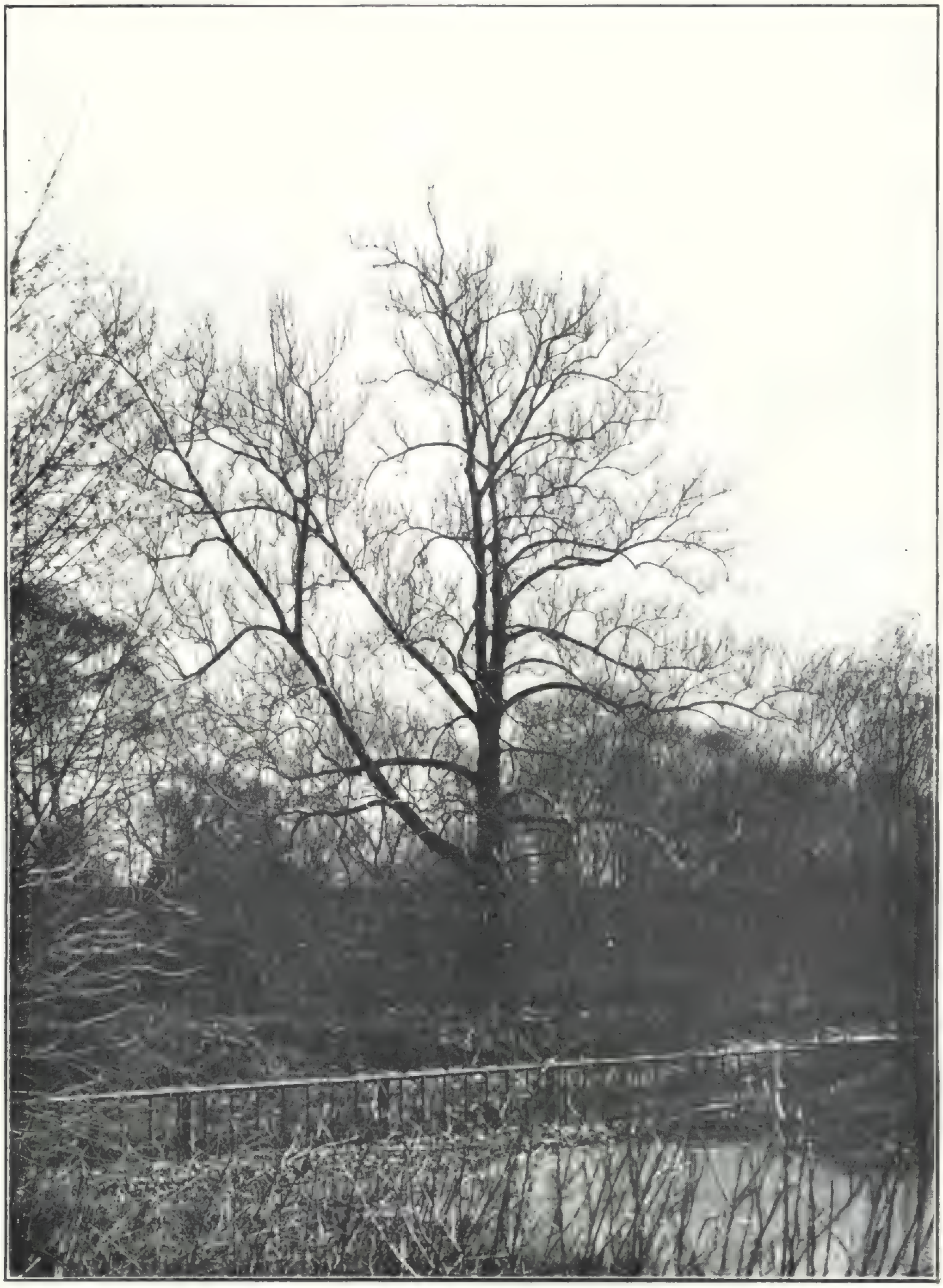
Description.—A large stately tree 75–150 feet high, with tall trunk and loose broad head and mottled green and white limbs. Bark dark reddish brown on trunk, breaking into small scaly plates, smooth and thin on branches, olive-green, flaking off in irregular plates, exposing whitish inner bark. Wood light reddish brown, hard, heavy, with prominent satiny pith rays. Buds conical, with hood-like scales, covered by hollow base of leafstalks and encircled by a single leaf scar. Leaves deciduous, alternate, simple, 5–6 inches long, 7–9 inches broad, 3–5-lobed, with broad shallow sinuses and wavy-toothed lobes, yellow-green above, paler beneath, and fuzzy on veins, yellow and papery in autumn; petiole

short, with hollow dilated base; stipules a tubular sheaf flaring into ruffle-like border. Flowers monoecious, in globular heads on flexible stems; staminate axillary, deep red; pistillate terminal, pale green tinged with red, with long stems. Fruit a dry pendulous ball, solitary or rarely two on a single peduncle, 1 inch in diameter, composed of close-set pointed akenes. Preferred habitat, borders of streams and rich bottom lands. Distribution, southern Maine to north shore of Lake Ontario, west to Minnesota and Nebraska, south to Florida and Texas. An excellent shade and ornamental tree, especially in cities and towns. Wood is used for furniture and inside woodwork of houses, also for butchers' blocks and tobacco boxes.

SHADING GREENHOUSES

On account of the intensity of the sun during the summer months in St. Louis it becomes necessary to apply temporary shade upon the roof glass of greenhouses to prevent burning and subsequent disfiguring of foliage, especially where exotic plants are concerned, such as ferns, orchids, etc., which naturally grow in shady places. With the advent of greenhouses in Europe, green-colored glass was used for the roof so as to offset the rays of the sun, and although this practice was soon abolished because of the density of the shade during winter and spring, the name greenhouse was retained.

Temporary green shading is generally used in Europe, and has been practiced in St. Louis at the Garden for several summers upon the large conservatories where the permanent plantations are housed. On the growing houses reserved for the production of bedding plants and floral display material the green shading is not necessary, as such plants need a strong light to develop their foliage and to accustom them to strong sunlight when planted outside. If a shade is required for certain kinds of floral display material a white covering is used. It was particularly noticeable last summer during the intense heat that numerous leaves of orchids, especially the slipper variety, were burned by the rays of the sun penetrating the sides of the house despite the glass being ground. Consequently, for the first time, the sides were shaded green as well as the roof.



SPECIMEN OF AMERICAN SYCAMORE ON GRANT FARM,
ST. LOUIS COUNTY.

SHADING GREENHOUSES.

Various preparations, such as mud spray, lime and salt spray, whitening, etc., all of which were costly and unsatisfactory as well as unsightly, have been tried for shading the greenhouses at the Garden. Until recently the formula used was: white lead, whiting, and shutter green, mixed with benzine to form a spray. The use of this preparation required over 300 gallons of benzine annually to cover the entire glass area, and the spray was both costly and unpleasant to apply. Frequently too much white lead would be used or the solution would not be sufficiently agitated and permanent splotches would result which it was necessary to scrape off for the winter season. Recent experiments have resulted in a much cheaper and more satisfactory spray which will withstand heavy rainy periods but nevertheless will wash off by fall. Water is used instead of benzine and potassium bichromate and powdered glue are substituted for white lead. The following is the formula used, the shutter green being omitted if a white shade is desired:

Water	1	gallon
Whiting	1	pound
Shutter green (dry)	2½	ounces
Powdered glue	3	ounces
Bichromate of potassium	1½	ounces

In preparation, the powdered glue and the potassium bichromate are dissolved by boiling in separate containers. The whiting is dissolved in cold water. The glue and bichromate of potassium should not be mixed with the water and whiting until just before using, and after mixing the solution should be kept from the sun to prevent premature setting or hardening. This solution, after screening, will pass readily through a hand spray or barrel pump. At the Garden the small hand syringe is used in applying the spray to the small houses, and if a sharp jerky movement is used an even shade will result, but the ordinary movement produces an irregular shade. In spraying the large conservatories the power spray supplied with Bordeaux nozzle is used to advantage.

PLANT IMMIGRANTS OF OUR LOCAL FLORA.

(Continued from March Bulletin.)

II. PERMANENTLY ESTABLISHED

Botanical name	Common name	Method of introduction	Locality	Natural distribution
ESCAPED FROM GARDENS, NATIVE OF UNITED STATES				
Catalpa bignonioides	Indian bean	Wind		Gulf States
Euphorbia marginata	White-margined spurge		Near old gardens and along roadsides	Minn. to Col., south to Tex.
Helianthus annuus	Common sunflower		Common in waste places	Minn. to N. W. Terr., Mo. and Tex.
Leersia lenticularis	Catch-fly grass	Locally by Prof. G. W. Letterman about 1880, spread by water fowl	Swamps near Allenton, Mo.	Va. to Minn. and southward
Robinia Pseudo-acacia	Black locust		Along ravines and streams	Pa. to Ga., Mo. and Ark.
ESCAPED FROM GARDENS, EXOTIC				
Ailanthus glandulosa	Tree-of-Heaven	Wind		China
Anthemis arvensis	Corn chamomile		Fields and waste places	Europe
Asparagus officinalis	Asparagus		Near old dwellings, along roadsides	Europe
Belamcanda chinensis	Blackberry lily	Birds	Near old dwellings	Asia
Chelidonium majus	Celandine		Waste places, roadsides	Europe
Chicorium Intybus	Chicory	Wind	Waste places	Europe
Coriandrum sativum	Coriander		Near old dwellings	Eurasia

Botanical name	Common name	Method of introduction	Locality	Natural distribution
Coronilla varia	Crown vetch	By Mr. August Fendler	Near Allenton, Mo.	Europe
Datura Stramonium	Jimson-weed		Waste places	Asia
Datura Tatula	Purple thorn-apple		Waste places	Tropical America
Daucus Carota	Wild carrot	Wind		Europe, Asia
Delphinium Ajacis	Larkspur		Along roadsides and railroads	Europe
Hemerocallis fulva	Day-lily		Near old dwellings and along roadsides	Europe, Asia
Humulus Lupulus	Hop	Wind	Common	Eurasia
Leonurus Cardiaca	Motherwort		Near old dwellings	Europe
Lilium tigrinum	Tiger lily		Open woods	China, Japan
Linaria vulgaris	Butter-and-eggs		Near old dwellings, along roadsides	Eurasia
Lycium halimifolium	Matrimony vine		Waste places, roadsides	Europe
Lysimachia Nummularia	Moneywort		Common	Europe
Malva rotundifolia	Running mallow		Waste places, roadsides	Europe, Asia
Marrubium vulgare	Hoarhound		Near old gardens, waste places	Europe
Nepeta Cataria	Catnip		Near dwellings	Europe, Asia
Nepeta hederacea	Ground ivy		Damp shady places, near dwellings	Europe
Ornithogalum nutans	Drooping Star-of-Bethlehem		Near old dwellings	Europe
Ornithogalum umbellatum	Star-of-Bethlehem		Near old dwellings	Europe
Perilla frutescens	Perilla	Rivers	Waste places	India

Botanical name	Common name	Method of introduction	Locality	Natural distribution
Polygonum cuspidatum	Japanese knotweed	Near Allenton, Mo.*		Japan
Saponaria officinalis	Bouncing Bet	Near old dwellings, along roadsides		Europe
Tanacetum vulgare	Tansy	Near old dwellings, along roadsides		Europe
Vinca minor	Periwinkle	Near old dwellings, along roadsides		Europe
AGRICULTURAL ESCAPES, NATIVE				
Carex scoparia	Pointed broom sedge	With grain		Me. to Fla. and Col.
Conobea multifida	Conobea	With grain and hay		Ont. to Kan. and south
Hordeum jubatum	Squirrel-tail grass	With grain		Ont. south to Kan., Col. and Cal.
Panicum dichotomiflorum	Spreading panicum	With grain		Me. to Neb. and south
Tripsacum dactyloides	Gama grass	With hay and grain		Conn. to Tex., north to Ill. and Mo.
AGRICULTURAL ESCAPES, EXOTIC				
Abutilon Theophrasti	Velvet leaf	With grain	Waste places	Asia
Agrostis alba	Red top	As a lawn grass		Europe
Agrostemma Githago	Corn cockle	With grain	Waste places	Europe, Asia
Allium vineale	Wild garlic	With grain	Troublesome weed in fields and meadows	Europe

*Thoroughly established in a plum thicket since 1901, when it was found by Prof. G. W. Letterman. Evidently from seeds carried by birds from the Missouri Botanical Garden, the only place locally where this plant was then growing.

Botanical name	Common name	Method of introduction	Locality	Natural distribution
Amaranthus hybridus	Slender pigweed	With grain	Troublesome weed in fields and meadows	Trop. America
Amaranthus paniculatus	Purple amaranth	With grain	Troublesome weed in fields and meadows	Trop. America
Amaranthus retroflexus	Rough pigweed	With grain	Troublesome weed in fields and meadows	Trop. America
Amaranthus spinosus	Spiny amaranth	With grain	Troublesome weed in fields and meadows	Trop. America
Anthemis Cotula	Mayweed	With grain	Common weed	Europe
Arctium minus	Common burdock	With grain	Common weed	Europe
Brassica alba	White mustard	With grain	Common weed	Europe, Asia
Bromus racemosus	Smooth brome-grass	With grain	Fields and waste places	Europe, Asia
Bromus secalinus	Cheat	With grain	Troublesome weed	Europe, Asia
Bromus tectorum	Downy brome-grass	With grain	Troublesome weed	Europe
Cannabis sativa	Hemp	With grain	Common weed	Europe, Asia
Capsella Bursa-pastoris	Shepherd's purse	With grain	Common weed	Europe
Chrysanthemum Leucanthemum	Ox-eye daisy	With seeds	Pastures and waste places	Europe, Asia
Commelina communis	Asiatic day-flower	With grain	Weed of gardens	Asia
Digitaria sanguinalis	Large crab-grass	With grain	Common weed	Europe
Dipsacus sylvestris	Teasel	Rivers	Waste places	Europe, Asia
Echinochloa Crus-galli	Barnyard grass	With grain	Common everywhere	Europe
Eleusine indica	Wire-grass	With grain	Fields and waste places	Old World Tropics
Eragrostis megastachya	Strong-scented eragrostis	With seeds	Waste and cultivated places	Europe

Botanical name	Common name	Method of introduction	Locality	Natural distribution
Galinsoga parviflora	Galinsoga	With grain	Waste places	Tropical America
Lamium amplexicaule	Henbit	With grain	Waste and cultivated ground	Asia
Lespedeza striata	Japan clover	In manures from stock ranges	Woods	Asia
Lolium perenne	Rye grass	With grain	Waste and cultivated ground	Eurasia
Medicago lupulina	Hop medick	With grain	Waste places	Eurasia
Medicago sativa	Alfalfa	Escaped from cultivated fields	Open places	Europe
Melilotus alba	White melilot	With grain	Everywhere	Eurasia
Melilotus officinalis	Yellow melilot	With grain	Roadsides	Europe
Nicandra Physalodes	Apple-of-Peru	With grain	Waste places	Peru
Phleum pratense	Timothy	Escaped from cultivated fields	Fields and meadows	Europe
Plantago lanceolata	English plantain	With grain	Common weed	Europe
Poa compressa	English blue grass	Escaped from fields	Waste places	Eurasia
Portulaca oleracea	Purslane	With grain	Common in cultivated ground	Europe
Rhaphanus Rhaphanistrum	Wild radish	With grain	Waste places	Europe
Rumex Acetosella	Sheep sorrel	With grain	Pernicious weed everywhere	Eurasia
Rumex crispus		With grain	Weed in fields and waste places	Europe, Asia
Rumex obtusifolius	Bitter dock	With grain	Waste places, weed	Europe, Asia
Setaria glauca	Yellow foxtail	With grain	Waste places and fields	Europe
Setaria italica	Italian millet	Seed introduced	Escaped near fields	Europe
Setaria verticillata	Foxtail grass	With grain	Waste places, fields	Europe
Setaria viridis	Green foxtail grass	With grain	Waste and cultivated ground	Europe
Sida spinosa	Prickly sida	With grain	Common weed	Tropics
Sisymbrium officinale	Hedge mustard	With grain	Weed in waste places	Europe, Asia
Trifolium arvense	Stone clover	With grain	Pastures and woods	Europe

Botanical name	Common name	Method of introduction	Locality	Natural distribution
rifolium procumbens	Hop-trefoil	With grain	Along roads and railroads	Europe
rifolium repens	White clover	With seeds	Common	Europe
erbascum Blattaria	Moth mullen	With grain	Cultivated grounds	Europe, Asia
erbascum Thapsus	Great mullen	With grain	Waste places, common	Europe, Asia
eronica arvensis	Wall speedwell	With grain	Cultivated fields	Europe
eronica peregrina	Purslane speedwell	With grain	Cultivated fields	Europe
anthium canadense	American cocklebur	With grain	Waste places	Asia

PLANTS INTRODUCED BY WIND, NATIVE

ndropogon Elliottii	Elliott's beard-grass		Troublesome weed in meadows	Pa. to Fla. and Tex.
ieracium longipilum	Long-bearded hawkweed		Prairies and dry woods	Ont. to Minn. and Tex.
luchea camphorata	Salt-marsh fleabane		In swamps	N. J. to Fla., near the coast

PLANTS INTRODUCED BY WIND, EXOTIC

maranthus graecizans	Tumble-weed		Open sandy places	Tropical America
actuca Scariola	Prickly lettuce		Waste places, common	Europe
actuca Scariola var. *integrata*	Wild lettuce		Everywhere pernicious weed	Europe
onchus asper	Spiny sow-thistle		Waste places, common	Europe

Botanical name	Common name	Locality	Natural distribution
Sonchus oleraceus	Annual sow-thistle	Waste places, common	Europe
Taraxacum officinale	Dandelion	Lawns, fields and meadows everywhere	Europe
PLANTS INTRODUCED BY RIVERS, NATIVE			
Brickellia grandiflora	Large-flowered thoroughwort	River banks	Mont. to S. Mo., N. M., west to Ore. and Ariz.
Cenchrus tribuloides	Bur-grass	River banks and bottoms	Me. to Minn., south to Fla.
Cleome graveolens	Clammy-weed	Sandy and gravelly river banks	N. W. Terr. south to Pa., Kan. and Col.
Cucurbita foetidissima	Wild pumpkin	Gravel banks	Neb. to Tex. and Mex.
Cycloloma atriplicifolium	Cycloloma	River banks	Minn. to Ind. and Ill., west to N. W. Terr., Neb. and Ariz.
Martynia louisiana	Unicorn plant	River bottoms	Ind. and Ia. to Mex.
PLANTS INTRODUCED BY RIVERS, EXOTIC			
Atriplex patula var *hastata*	Halberd-leaved orache	Waste places	Europe
Cucurbita Pepo var. *pyriformis*	Pumpkin	Along streams, river bottoms	Asia Minor

Botanical name	Common name	Locality	Natural distribution
Heleochloa schoenoides	Rush cat-tail grass	Waste places	Europe
Heliotropium indicum	Indian heliotrope	River banks and bottoms	India
PLANTS INTRODUCED BY RAILROADS, NATIVE			
Acalypha ostryaefolia	Hornbeam three-seeded mercury	Along river bluff in S. St. Louis	N. J. to Kan., Fla. and Mex.
Amaranthus blitoides	Prostrate amaranth	Weed in waste places	West of the Rockies
Dysodia papposa	False dog-fennel	Along roads and streams	Ohio to Neb., south to Mex. and Ariz.
Helianthus occidentalis	Few-leaved sunflower	Along roadsides	Ohio to Minn., south to Fla.
Helenium tenuifolium	Fine-leaved sneezeweed	Waste places	Va. to Fla., Mo., Ark. and Tex.
Leptochloa fascicularis	Salt-meadow leptochloa	Roadside ditches	Mass., south along coast
Pyrrhopappus carolinianus	False dandelion	Along roadsides	Del. to Fla., Mo. and Tex.
Solanum rostratum	Beaked nightshade	Waste places	Nev., Neb. and N. M.
Solanum Torreyi	Torrey's nightshade	Waste places	Prairies, Kan., and Tex.
Verbesina encelioides	Golden crownbeard	Moist soil, not common	Kan. to Tex., Ariz. and Mex., also Fla.

Botanical name	Common name	Locality	Natural distribution
PLANTS INTRODUCED BY RAILROADS, EXOTIC			
Agropyrum repens	Couch-grass	Fields and waste places	Europe, Asia
Dactyloctenium Aegyptium	Egyptian grass	Along railroads, not common	Asia, Africa
Linaria Elatine	Toad-flax	Along the Mo. Pac. R. R. near Glencoe, Mo.	Europe
Mollugo verticillata	Carpet-weed	Common in cultivated ground	South America
Sorghum Halepense	Johnson grass	Railroad banks and waste places	Europe, Asia
Tribulus terrestris	Ground bur-nut	River banks and bottoms	Europe

NOTES

Mr. G. H. Pring, Horticulturist to the Garden, gave an illustrated talk on "European Gardens," at the Clifton Heights Presbyterian Church, April 20.

Mr. L. P. Jensen, Arboriculturist to the Garden, gave an illustrated lecture before the Parkview Association, at the Grace Methodist Episcopal Church, May 1, on "The Planting and Care of Trees in St. Louis."

On May 23, the delegates attending the convention of the Medical Library Association of America visited the Garden and were shown about the library and grounds by special guides. One of the features of their visit was an exhibit of the rare old herbals in the Garden collection and a descriptive talk on the same by Dr. George T. Moore, Director of the Garden.

Dr. B. M. Duggar, Physiologist to the Garden, presented a paper before the St. Louis section of the American Chem-

ical Society, at the Annex Hotel, May 1, on "The Use of Microörganisms in Industrial Chemistry."

The third annual flower show given under the auspices of the Garden Club of St. Louis was held in the floral display house at the Garden, May 20 and 21.

Dr. D. T. MacDougal, Director Botanical Research, Carnegie Institution of Washington, Desert Laboratory, Tucson, Arizona, visited the Garden May 3-4, and on May 4 gave a talk before the annual meeting of Sigma Xi and Phi Beta Kappa at the Graham Memorial Chapel, Washington University, on "Conceptions of the Physical Basis of Life."

Professor W. L. Howard, of the University of California Agricultural Experiment Station, Berkeley, California, visited the Garden May 15-20, working over the herbarium and living plant collections of the genus Prunus, of which he is making a special study.

Recent visitors to the Garden include Dr. H. Nakano, professor of botany in the Agricultural College and in the High School of Kagoshima, Japan, and Miss Bertha Lutz, secretary of the National Museum, Rio de Janeiro, and president of the Brazilian League for the Emancipation of Women.

STATISTICAL INFORMATION FOR APRIL, 1922

GARDEN ATTENDANCE:

Total number of visitors	27,505

PLANT ACCESSIONS:

Total number of plants received as gifts	4
Total number of seed packets received in exchange	1,348
Total number of plants received in exchange	298

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	36
Total number of books and pamphlets donated	134

HERBARIUM ACCESSIONS:

By Gift—

Jenkins, Miss A. E.—Authentic specimen of *Sclerotinia carunculoides* Siegler & Jenkins	1
Latham, Roy—*Peniophora laevigata* Fr. from Long Island, New York	1

Ledman, O. S.—*Rumex hymenosepalus* Torr. and *Sphaeralcea cuspidata* Britt., plants of the pharmaceutical trade	2
von Schrenk, Dr. Hermann—Plants of Santo Domingo.	126
von Schrenk, Dr. Hermann—Plants of Lake Louise...	5
Whetzel, Prof. H. H.—Fungi of Bermuda.....	7
By Exchange—	
Kashyap, Prof. S. R.—*Isoetes Coromandelina* L. from South India	1
By Purchase—	
Dutton, D. Lewis—Plants of Vermont.....	226
By Field Work—	
Greenman, J. M. and M. T.—Plants of Central America, estimated at.....	2,500
Total.....	2,869

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from December to April, 1:00 P. M. until sunset, from April to December, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

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Missouri Botanical Garden Bulletin

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SPECIMEN OF WHITE RED-BUD AT GARDEN

Missouri Botanical Garden Bulletin

Vol. X **St. Louis, Mo., June, 1922** **No. 6**

SCHOOL FOR GARDENING

The School for Gardening of the Missouri Botanical Garden, provided for in the will of Henry Shaw, is maintained for the purpose of training young men and women in a thorough knowledge of all the branches of floriculture, horticulture, and landscape design, as well as certain aspects of systematic and economic botany. The course as arranged covers three years' work and cannot be completed in less time. The mornings during the entire course are devoted to practical work in the various departments of the Garden, both indoors and outdoors, the work being arranged to afford as much experience and practice as possible in propagating, growing, and caring for the large variety of plants maintained in the Garden collections. The afternoons are given over to theoretical work and lectures in the different courses offered.

Registration cards for entry to the school may be obtained by writing the Director, Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis. Graduates of first-class high schools, the certificates of which are accepted by Washington University, will be accepted without examination. Candidates unable to present such certificate must present themselves for examination at the School for Gardening, 2315 Tower Grove Avenue, on the first Saturday in June at nine a. m. The subjects covered in entrance examinations are United States history, English literature, arithmetic, algebra, trigonometry, elements of botany and one other science (zoology, chemistry, physics, or physiology) to be selected by the candidate, and one foreign language (German, French, Spanish, Latin, or Greek) according to the training of the candidate.

Candidates living some distance from St. Louis may send, with their registration card, the name and address of the

principal or a teacher in the nearest high school who will be willing to take charge of their examination. The charges for and place of holding such examination must be a matter of mutual arrangement between the examiner and the student.

Tuition.—The tuition is $200 a year, payable one-half at the beginning of the school year, and one-half at the middle of the year. Tuition for a single course of nine months or more is $50, payable in advance.

Calendar.—The calendar of the school year corresponds to that of Washington University, including holidays and vacations. The school term extends approximately from the last Thursday in September until the first of June. Special arrangements will be made for students desiring to continue practical work during a part or all of the summer months.

Living Expense.—Room and board may be obtained in the vicinity of the Garden at an approximate cost of from $35 to $50 per month.

Scholarships.—A few scholarships are available to exceptionally well-qualified students between the ages of sixteen and twenty years, these being awarded on competitive examination at the same time and place and in the same subjects as indicated above. Application blanks for scholarships may be obtained by writing the Director, Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis, and must be filled out and returned by May 15.

Certificate.—No degree is conferred upon the completion of the three years' course, but, after passing such examinations as may be required and presenting a satisfactory thesis, each student shall receive a certificate from the Garden, indicating the work accomplished.

OFFICERS OF ADMINISTRATION AND INSTRUCTION

George Thomas Moore, A. M., Ph. D., *Director of the Garden, and Engelmann Professor of Botany in the Henry Shaw School of Botany of Washington University.*

Jesse More Greenman, A. M., Ph. D., *Curator of the Herbarium, and Professor in the Henry Shaw School of Botany of Washington University.*

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George Harry Pring, *Horticulturist to the Garden.*
Royal Botanic Gardens, Kew, 1899–1906; Missouri Botanical Garden 1906–

John Noyes, S. B., *Landscape Designer to the Garden.*
S. B. Massachusetts Agricultural College; Instructor in Landscape Gardening, Massachusetts Agricultural College, 1909–11; with Warren H. Manning, Boston, 1911–14; Missouri Botanical Garden, 1914–

George Miller Armstrong, B. S., Ph. D., *Assistant Professor in the Henry Shaw School of Botany of Washington University.*

Lars Peter Jensen, *Arboriculturist to the Garden.*

Paul August Kohl, *Floriculturist to the Garden.*
Missouri Botanical Garden certificate, 1917.

John H. Kellogg, Missouri Botanical Garden.

COURSES OF INSTRUCTION

First Year

1. General Botany. (At Washington University.) An introductory course intended to serve as the basis for the study of the structure, function, classification and evolution of the plant kingdom. October to June. (Armstrong)

2. Drawing. (At Washington University.) Lettering, geometrical drawing, projections, perspective, architectural drawing. Pencil, charcoal and water-color work. October to June. (.....)

Second Year

3. Plant Materials. Flowering trees, shrubs, perennials, and annuals used in landscape designs and private gardens in this country. Intended to familiarize the student with the variety of flowering material at his disposal, together with the facilities of various nurseries and growers in America. October to January; April to June. (Kellogg)

4. Plant Breeding. The principles and practice of plant breeding. Hybridization and selection. The origin of horticultural varieties. October to April. (Anderson)

5. Dendrology. Nursery work. Planting, growing, pruning, and care of trees and shrubs. Tree surgery. Fundamentals of forestry, including forest management, mensuration.

protection, utilization, by-products, and wood preservation. October to January. (Jensen)

6. Forcing Fruits and Vegetables. Forcing of grapes, peaches, nectarines, figs, strawberries, pineapples, etc., under glass. Forcing of lettuce, tomatoes, cucumbers, melons, radishes, etc., under glass. January to April. (Kohl)

7. General Floriculture. The general principles of greenhouse management. Methods of propagation by seeds, cuttings, division, layering, grafting, etc., under glass and outdoors. Cultural methods for successful growing of outdoor roses, bulbs, tubers, decorative and bedding plants, etc. January to April. (Anderson)

8. Soils and Fertilizers. A consideration of the soil as a medium for root development and as a reservoir for the storage and consumption of plant nutrients. Functions of manures and commercial fertilizers. April to June. (Kohl)

9. Pure Design. Theory and practice; its application to all arts, especially landscape gardening. October to January. (Noyes)

10. Principles of Landscape Gardening. Lectures on history and theory. Practice in drafting, rendering in ink and water colors; office methods. Analysis of landscape designs. January to April. (Noyes)

11. Landscape Design. Practice in design of home grounds, private estates, parks, playgrounds, cemeteries, subdivisions, etc. April to June. (Noyes)

Third Year

12. Economic Botany. The uses of plants and their products; fibers, fruits, condiments, perfumes, medicinal plants, etc. October to January. (Pring)

13. Entomology. Study of the principal groups of insects of economic importance. October to January. (Anderson)

14. Disease Control. Methods of control of fungous and insect diseases affecting greenhouse and other cultivated plants and trees. Sprays and spray machinery. January to June. (Anderson)

3. Plant Materials (*Continued*). January to April. (Kellogg)

11. Landscape Design (*Continued*). October to April. (Noyes)

15. Commercial Floriculture. Culture of roses, carnations, chrysanthemums, violets, orchids, sweet peas, bulbs, ferns, palms, and other decorative and flowering plants. Marketing, packing, shipping, designing. April to June. (Pring)

16. Planting Design. Study of harmony of color, form, foliage, etc., in plants for outdoor use; analysis of designs. Practice in planting design for various locations and purposes, for private estates, parks, city streets, flower gardens, etc. October to April. (Noyes)

17. Garden Architecture. Lectures on architectural styles and design. Practice in design of garden furniture, pergolas, arbors, summer houses, gates, entrances, etc. April to June. (Noyes)

18. Thesis. During the second year the student will choose or be assigned some definite problem leading out of the courses given, and in the third year he will be expected to pursue this topic with the intention of presenting a thesis covering the work done. October to June.

OUTLINE OF MORNING WORK

OUTDOOR

Rose Garden.—Study of types, such as teas, hybrid teas, hybrid perpetuals, climbers, rugosas, polyanthas, etc. Methods of propagation, including cuttings, grafting, layering, and budding. Testing of varieties as to their adaptability to outdoor culture. Rose breeding. Diseases and insects and their control. General cultivation, planting and pruning.

Arboretum.—Practice in tree surgery. Correct pruning of trees. Planting and root pruning. Tree moving. General cultivation. Practical methods of spraying; spraying machinery.

Medicinal Garden.—Study of medicinal plants with special reference to commonly known types.

Vegetable Garden.—Winter forcing of vegetables. Raising vegetables for spring planting. Frame culture. Outdoor culture and general cultivation. The use of different types of cultivators. Various irrigation systems.

Nursery.—Various systems of nursery practice, including work with perennials, trees, and shrubs. Methods of propagation, seed stratification, and sowing; softwood and hardwood cuttings, layering, grafting, and budding. Cultivation.

Economic Garden.—The study and culture, on a small scale, of farm crops, bee plants, herbs, trained fruits, vines, ornamental grasses, hedge plants. Model backyard gardens.

Wild-flower Garden.—Comprehensive study and general culture of herbaceous material native to North America.

Floral Display.—Planting and planning of formal and informal beds, and the use of various plants and bulbs for succession of spring and summer displays, including work in the Italian garden, iris garden, perennial garden, main garden, test garden, and knolls.

Water Gardens.—Propagation, study, and culture of hardy and tropical aquatic plants. Winter and summer treatment of tropical water lilies.

Lawns and Shrubbery.—Preparation of soil for lawns, sodding, mowing, watering, weed eradication. Testing grasses for lawns. The use of hand and power mowers. Fertilizers.

General cultivation of shrubs; spring and fall pruning; differentiation between flowering and non-flowering wood. Study of twigs and fruits with special reference to winter effects.

CONSERVATORIES

Cultivation, growing, potting; types of soil; insect control; irrigation of:

1. Cycads, ferns, palms, economic plants, succulents.
2. Orchids.
3. Citrus plants, aroids, and bromeliads.
4. Chrysanthemums, cyclamen, cinerarias, calceolarias, etc., for floral display.—Forcing bulbs.
5. Forced fruits.—General methods of forcing indoor grapes, peaches, nectarines, cherries, etc.; training, pruning, thinning, and fertilizing.
6. Floral display.—Design and arrangement of indoor floral exhibits. Care of plants on exhibition.
7. Propagation.—Seed testing, seed sowing, transplanting, etc., of annuals, biennials, and perennials; making softwood cuttings and propagation of general outside bedding plants. Study of propagation, including various rooting media and temperature and moisture requirements. Methods of propagation, by cuttings, air-layering, inarching, stem division, leaf cuttings; bulb propagation.

SCHEDULE OF AFTERNOON WORK

First year

Time	Monday	Tuesday	Wednesday	Thursday	Friday
Oct. to June	**Drawing**	General Botany	Drawing	General Botany	Drawing

Second year

Oct. to Jan.	**Plant Materials**	Plant Breeding	Dendrology	Pure Design	**Pure** Design
Jan. to Apr.	Forcing fruits and vegetables; veg. garden-ing	General Floriculture	Plant Breeding	Principles of Landscape Gardening	Principles of Landscape Gardening
Apr. to June	**Plant Materials**	General Floriculture	Soils and Fertilizers	Landscape Design	Landscape Design

Third year

Oct. to Jan.	**Economic Botany**	Entomology	Thesis	Landscape Design	Planting Design
Jan. to Apr.	Disease Control	Plant Materials	Thesis	Landscape Design	Planting Design
Apr. to June	Disease Control	Commercial Floriculture	Thesis	Garden Architecture	Garden Architecture

PLANTS OF OUR LOCAL FLORA WHICH HAVE BEEN USED BY MAN AS FOOD

Plants have always formed one of the most important factors in the human diet, and the aborigines and early settlers of the American continent were often entirely dependent on the plants of their time for the maintenance of life. Some of the varieties of edible plants then known have since been replaced by improved and superior kinds and others are of no particular value except in an emergency. Many of our native food plants have not received the attention they deserve, and there are great possibilities remaining in the introduction and improvement of material for culinary purposes.

The following quotation from an address by the late Dr. Asa Gray, before the American Pomological Society, in 1873, is interesting in this connection:

"It would be curious to speculate as to what our pomology would have been if the civilization from which it, and we ourselves, have sprung, had had its birthplace among the southern shores of our great lakes, the northern shores of the Gulf of Mexico and the intervening Mississippi, instead of the Levant, Mesopotamia, and the Nile, and our old world had been open to us as a new world, less than four hundred years old.

"Seemingly we should not have as great a variety of choice fruits as we have now and they would mostly have been different, but probably neither scanty nor poor. In grapes at least we should have been gainers. Our five or six available species, of which we are now first beginning to know the capabilities, would have given at least as many choice sorts and as wide a diversity as we now have of pears; while the pears would be a recent acquisition, somewhat as our American grapes now are. Our apples would have been developed from *Pyrus coronaria*, and might have equaled anything we actually possess from *Pyrus Malus* in flavor, though perhaps not in variety, if it be true, as Karl Koch supposes, that the apples of the orchards are from three or four species. At least one of our hawthorns, *Crataegus tomentosa*, in some varieties, bears a large and delicately flavored fruit evidently capable of increase in size; it might have been in the front rank of pomaceous fruits. In a smaller way our service berry would have been turned to good account; our plums would have been the progeny of the Chicasa, the beach plum, and

our wild red and yellow *Prunus americana,* which have already shown great capacity for improvement; our cherries might have been as well flavored, but probably not so large as they are now. But instead of peaches and figs we should be discussing manifold and most luscious varieties of persimmon and papaw, the former probably equal to the Kaki, acquired from the Far East. As to strawberries, gooseberries, and currants, we should have lost nothing and gained something, as we possess several species as well as the European types themselves. As to blackberries and raspberries, we should have been better off than now, by the earlier development and diversification of our indigenous species.

"And we might have had all of our finest strawberries a thousand or more years ago, these having come from our American types, *Fragaria virginiana* and its varieties (which, as well as the old world *F. vesca,* occurs all across the continent), and *F. Chilensis* which ascends the Pacific coast to Oregon.

"Had civilization had its birthplace in America, our groundnut, *Apios tuberosa,* would have been the first developed esculent tuber, and would probably have held its place in the first rank along with potatoes and sweet potatoes of later acquisition * * * *

"Finally, if pomology includes nuts, there is a promising field uncultivated. Our wild chestnuts are sweeter than those of the old world; it would be well to try whether races might not be developed with the nuts as large as marrows or Spanish chestnuts, and without diminution of flavor. If we were not too easily satisfied with a mere choice among spontaneous hickory nuts, we might have much better and thinner shelled ones. * * * * The butternuts and black walnuts are waiting to have their excess of oil turned into farinaceous and sugary matter, and their shells thinned and smoothed by continuous good breeding; when they will much surpass the European walnut.

"All this requires time, unlimited time; but it is not for those who are enjoying the fruits which it has taken thousands of years to perfect, to refrain from the good work which is to increase the enjoyment of far future generations."

Since the delivery of this address by Dr. Gray, much has been accomplished with our native fruits, particularly the nuts, but the possibilities are still unlimited and may

include the improvement of plants whose roots, tubers, or herbage may be used as delicious and nutritious food.

The following list comprises some of the principal plants which have been, or are, used as food in our local territory. In addition to these we might add the many indigenous species of mushrooms found in abundance during the growing season, which are not included in this article.

TUBERS AND ROOTS USED

Allium cernuum, nodding wild onion.
Allium vineale, wild garlic.

The bulbs of these plants were much used by the Indians who dug them out of the ground with sticks. Owing to their stimulant, alterative, and antiscorbutic properties, they were particularly beneficial to the system in early spring. They were also dried and stored for winter use.

Amphicarpaea monoica, hog peanut.
Amphicarpaea Pitcheri, hog peanut.

The tubers of the hog peanut were eaten raw.

Apios tuberosa, groundnut.

Prepared like potatoes, also eaten raw.

Camassia esculenta, wild hyacinth or camass.

The bulb of this plant formed a very important item of diet of the Indians and is said to have been a general article of trade between the tribes. The tribal name of the Digger Indians is supposed to have been received because of the extent which they gathered this bulb. The camass has little taste when raw, but is remarkably sweet when cooked, its name being derived from the Indian word "chamashish," meaning sweet-tasting. The bulbs were cooked in every way known to the Indians, even made into loaves which were sliced like bread. Eaten in large quantities the plant has both emetic and purgative effects.

Claytonia virginica, spring beauty.

Bulbs eaten raw or boiled like potatoes.

Cyperus esculentus, yellow nut-grass.

The tubers of this plant have a sweet nutty flavor and are very nutritious eaten raw.

Helianthus tuberosus, Jerusalem artichoke.

This plant is extensively planted in European gardens. The tubers are cooked like potatoes and are also eaten raw in emergency.

Nelumbo lutea, American lotus.

The tubers are eaten raw, while the seeds are roasted and eaten like potatoes.

Psoralea esculenta, prairie turnip.

Roots eaten raw by the Indians and early explorers.

FRUITS USED

Amelanchier canadensis.
For making preserves, jellies, and pies.

Asimina triloba, papaw.
Eaten raw, like bananas.

Celtis mississippiensis, hackberry.
Celtis occidentalis, hackberry.
Celtis pumila, hackberry.
The hackberry is eaten raw in emergency.

Crataegus mollis, red-fruited thorn.
Crataegus tomentosa, pear haw.
Eaten raw or made into preserves and jellies. Other species of hawthorn are also edible, but the ones mentioned have the largest fruit.

Diospyrus virginiana, persimmon.
Eaten raw and also used in puddings and pies.

Fragaria virginiana, Virginia strawberry.
Used in the same way as the cultivated strawberry.

Helianthus annuus, sunflower.
Oil used in cooking made from seeds.

Martynia proboscidea, unicorn plant.
The half-grown pods were used in various ways by the Indians, and were made into pickles by the early settlers.

Morus rubra, red mulberry.
Eaten raw and in pies and preserves.

Opuntia Rafinesquii, western prickly pear.
Eaten raw or made into preserves.

Podophyllum peltatum, May-apple.
Eaten raw.

Prunus americana, wild red plum.
Prunus hortulana, wild goose plum.
Prunus serotina, wild black cherry.
The wild plums and cherries are used in the same way as the cultivated species.

Pyrus angustifolia, narrow-leaved crab-apple.
Pyrus coronaria, American crab-apple.
Pyrus ioensis, western crab-apple.
The crab-apples make delicious jellies and preserves.

Ribes Cynosbati, gooseberry.
Ribes gracile, Missouri gooseberry.
Eaten raw and in pies and preserves.

Rubus canadensis, dewberry.
Rubus occidentalis, black raspberry.
Rubus villosus, high-bush blackberry.

Eaten raw and used for preserves, jellies, pies, etc.

Sambucus canadensis, American elder.

For jellies and preserves. Wine made from both the fruit and the flowers.

Typha latifolia, cat-tail.

When the inflorescences are still partly covered by the upper leaves, their thick fleshy central portions (rhacis) are tender, mucilaginous, and juicy, and were used by the Indians in the making of a soup. They were also eaten stewed or steamed.

Vaccinium corymbosum, tall blueberry.
Vaccinium vacillans, low blueberry.

In jellies, pies, and preserves.

Viburnum Lentago, sheep-berry.
Viburnum prunifolium, black haw.
Viburnum rufidulum, southern black haw.

Eaten raw.

Vitis aestivalis, summer grape.
Vitis cinerea, downy grape.
Vitis cordifolia, frost grape.
Vitis rupestris, sugar grape.
Vitis vulpina, riverside grape.

The grapes are used in the making of jelly and wine.

Zizania aquatica, wild rice.

One of the stable foods of the Indians, used in the same way as the cultivated rice.

NUTS USED

Carya alba, mocker nut.
Carya glabra, pignut.
Carya illinoensis, pecan.
Carya laciniosa, big shellbark hickory.
Carya microcarpa, shell-fruited hickory.
Carya ovata, shellbark hickory.
Corylus americana, hazel.
Juglans cinerea, butternut.
Juglans nigra, black walnut.

The kernels of the above nuts are used for many purposes, both raw and in baking.

Quercus alba, white oak.
Quercus lyrata, swamp oak.
Quercus macrocarpa, bur oak.
Quercus Muhlenbergii, chestnut oak.
Quercus stellata, post oak.

The acorns were much used by the Indians, both in a raw state or boiled and baked into bread. They are less fatty than other nuts, but are equally nitrogenous. Most varieties are more or less astringent or bitter, but these disagreeable qualities were removed in several ways, most frequently by leaching. This was accomplished as follows: The acorns were shelled by lightly tapping them upon a rock with a small stone mallet. The kernels were then pulverized in the hollow of a rock. A basket was packed with coarse gravel, a shallow cavity being left on the surface. This cavity was lined with fine gravel, then sand, on which the acorn flour was deposited. Water was slowly percolated through the mass, and when the escaping fluid became clear the process was considered finished. Lye was sometimes added to the water to hasten the process. The small amount of fat gathering on top of the water when the acorns were boiled was skimmed off and used by the Indians as a hair oil.

PLANTS OR FOLIAGE USED AS SALADS OR POTHERBS

Amaranthus paniculatus, pigweed.
Amaranthus retroflexus, rough pigweed.

Salad and potherb.

Arabis canadensis, sickle-pod.
Arabis laevigata, smooth rock cress.
Arabis virginica, Virginia rock cress.

Potherb.

Asclepias tuberosa. Butterfly weed.

It is said that some of the Indians cultivated this plant, cutting the young shoots when a few inches long and boiling and serving them like asparagus. The young pods were used in soup, like gumbo.

Brassica alba, white mustard.

Campanula americana, American bellflower.

Capsella Bursa-pastoris, shepherd's purse.

Cardamine bulbosa, bulbous cress.
Cardamine hirsuta, hairy bitter cress.

All the above plants were used both as potherbs and salads.

Chenopodium album, lamb's quarters.

The tender tips of this plant may be boiled like spinach, which it closely resembles. This was much used by the Indians.

Dentaria laciniata, pepper-root.
Ellisia Nyctelea, nyctelea.
Erigenia bulbosa, harbinger-of-spring.
Erysimum asperum, western wall-flower.
Erythronium albidum, white adder's tongue.
Hybanthus concolor, green violet.

The above plants were used as potherbs.

Lactuca canadensis, wild lettuce.
Lactuca floridana, wild lettuce.
Lactuca hirsuta, wild lettuce.
Lactuca integrifolia, wild lettuce.
Lactuca ludoviciana, wild lettuce.
Lactuca spicata, wild lettuce.
Lactuca villosa, wild lettuce.

Wild lettuce is used both as a potherb and salad.

Lepidium apetalum, pepper-grass.
Lepidium campestre, field cress.
Lepidium virginicum, wild pepper-grass.

Mertensia virginica, blue-bell.

Potherb.

Oxalis corniculata, yellow wood-sorrel.
Oxalis violacea, violet wood-sorrel.

Used for salad, and like rhubarb for pies.

Phragmites communis, reed grass.

Early in the season the stems are rich in starchy and sugary matter, and if dried in the sun, ground, and the fine cellular tissues sifted out and softened with water, they may be made into cakes, which are set near the fire to roast. When they become brown they are eaten like taffy. The stem exudes a sugary substance, which was eaten by the Indians.

Phytolacca decandra, pokeroot.

The seeds and root of this plant are poisonous. Very small quantities of the root will cause vomiting, purging, convulsions, and death. Such a plant should therefore be eaten with extreme

caution. The young shoots taken when the size of ordinary asparagus stalks are said to be delicious and very nutritious. They should be put into cold water, which, after coming to a boil, should be replaced by fresh water, and well drained before serving.

Polemonium reptans, Greek valerian.
Portulaca oleracea, purslane.
Radicula aquatica, lake water cress.
Radicula Armoracia, horseradish.
Radicula palustris, yellow water cress.
Rumex Acetosella, sheep sorrel.
Rumex crispus, curled dock.

The above plants were used as potherbs.

Scirpus validus, great bulrush.

This was without question one of the most important food plants of the American savage and frontiersman, having often saved them from starvation. It is distributed over thousands of square miles in the marshes along the coast on both oceans and at the gulf and borders of the lakes and rivers throughout North America. The young shoots are eaten raw and are crisp, juicy, sweetish, and very nourishing. Even after the shoots are several feet high and in bloom the succulent bases may be chewed. They can also be cooked.

Scrophularia marilandica, figwort.
Sisymbrium altissimum, tall sisymbrium.
Sisymbrium officinale, hedge mustard.
Sonchus asper, spiny sow thistle.
Sonchus oleraceus, sow thistle.
Specularia perfoliata, Venus' looking-glass.
Taraxacum officinale, dandelion.

All the above plants were used as potherbs.

PLANTS FOR BEVERAGES

In addition to the commonly known elder, dandelion, cherry, and grape, from which wines are made, the following are, or have been, used for domestic beverages:

Benzoin aestivale, spice-bush. Tea made of twigs.

Ceanothus americanus, New Jersey tea. Tea made from leaves.

Cichorium Intybus, chicory. Substitute for coffee.

Gymnocladus canadensis. Kentucky coffee tree. Used as a substitute for coffee during the Revolutionary War.

Humulus Lupulus, common hop. Seed pods used in brewing of beer.

Sassafras officinale, sassafras. Used as a substitute for tea in the southern states.

WHITE RED-BUD

One of the most unusual spring-flowering trees in the Garden is the new white variety of red-bud (*Cercis canadensis* var. *alba*). This rare and most interesting deviation from the type species originated in the old nursery of John Teas and Son, Carthage, Mo. In 1903 a small plant was purchased from Mr. Teas for trial at the Garden to ascertain whether the white color was fixed. Repeated observations have proved the fixed character of the flower, also the foliage, which is a much lighter green upon the upper surface of the leaves than the usual type, and the absence of the reddish coloration of both petioles and peduncles, further confirming the fact that this plant is an albino. This latter factor permits segregation from the type species when the tree is not in bloom.

In view of the abandonment of the old Teas nursery, the remainder of the stock was purchased in 1920, thus placing the entire original stock in the Garden collection. Seven plants were received, only one of which showed a slight coloration in the leaf petioles, the tree producing light pink flowers this spring.

Description of horticultural white-flowering form of Cercis canadensis.—Height of original plant twelve feet, with broad flat head of slender, smooth, thornless, angular branchlets. Bark reddish brown, furrowed deeply and closely, broken into small scaly plates; twigs light green. Wood heavy, hard, close-grained, weak, red-brown. Buds inconspicuous, axillary, scaly, blunt. Leaves simple, entire, broadly heart-shaped or ovate, alternate, deciduous, on long, slender, smooth petioles which are enlarged at the apex; autumn color yellow. Flowers bloom in April before leaves appear, in axillary fascicles, pea-like, half an inch long, white, numerous, very striking when planted in association with the type species. Fruit, a pod, thin, pointed, flat, smooth, green, stalked, two to three inches long; original specimen rarely produces seed pods.

BRANCH OF WHITE RED-BUD

NOTES.

Dr. C. J. Humphrey, U. S. Forest Pathologist, Madison, Wisconsin, visited the mycological herbarium for a few days recently in connection with his work on the genus Merulius.

Mr. G. H. Pring, Horticulturist to the Garden, gave the following lectures, June 2: "God's Beautiful Flowers and How They Are Used," before the Women's Christian Temperance Union; and "Advantages Pertaining to the Profession of Gardening," before the senior students of Cleveland High School.

Mr. G. H. Pring is the author of an article in the May issue of the Gardeners' Chronicle of America, entitled "Factors to Be Considered in Breeding Water-Lilies." The article is illustrated with photographs of *Nymphaea* "Mrs. Edwards Whitaker" and with diagrams of the various groups and sub-groups of the genus.

At the annual commencement of Washington University, June 8, degrees were conferred upon members of the graduate laboratory of the Missouri Botanical Garden, as follows: Doctor of Philosophy, Harry M. Jennison and Harry R. Rosen; Master of Science, Carl G. Deuber, Mildred L. Johnson, and Cora M. Mautz.

Mr. John H. Kellogg and Mr. L. P. Jensen, of the Missouri Botanical Garden, gave an illustrated lecture before the Natural History Museum Association, June 21, on "Our Native Plants and How to Know Them."

Among those visiting the Garden recently were: Dr. Seiya Ito, professor of plant pathology and mycology, College of Agriculture, Hokkaido Imperial University, Sapporo, Japan; Dr. M. C. Merrill, formerly research assistant at the Garden, now professor of horticulture, Utah Agricultural College, Logan, Utah; Dr. Robert W. Webb, formerly Rufus J. Lackland Fellow at the Garden, now plant pathologist, U. S. Department of Agriculture, Madison, Wisconsin; Dr. W. C. O'Kane, of the crop protection bureau, New Hampshire College of Agriculture and Mechanical Arts, Durham, N. H.; and Dr. F. V. Coville, Curator U. S. National Herbarium, Washington, D. C.; and Mr. A. Pedersen, gardener and horticultural adviser of the Danish Gardeners' Association, Copenhagen, Denmark.

STATISTICAL INFORMATION FOR MAY, 1922.

GARDEN ATTENDANCE:

Total number of visitors	48,989

PLANT ACCESSIONS:

Total number of plants received as gifts	1
Total number of seed packets received in exchange	392
Total number of plants received in exchange	321

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	20
Total number of books and pamphlets donated	131

HERBARIUM ACCESSIONS:

By Gift—

Cornell University, Botanical Department—Fungi of Central America	5
Drushel, J. A.—Plants of Vermont, New York, Ohio, Michigan, and Missouri	25
Howard, Prof. W. L.—Specimens of *Prunus* from Italy and France	9

By Exchange—

Noe, Prof. Adolph Carl—Plants of Albania and Montenegro, collected by I. Dörfler	52

By Purchase—

Holzinger, Dr. J. M.—Mosses of North America, Fasc. XIX, Nos. 451-475 inclusive	25
Total	116

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from November to April, 1:00 P. M. until sunset, from April to November, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

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MISSOURI BOTANICAL GARDEN BULLETIN

Vol. X SEPTEMBER, 1922 No. 7

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DWARF JAPANESE MORNING-GLORIES.

Missouri Botanical Garden Bulletin

Vol. X St. Louis, Mo., September, 1922 No. 7

JAPANESE MORNING-GLORIES

Some of our most popular flowers have either originated, or been much improved in Japan. The morning-glory, called by the Japanese "asagao," is one of the plants to which they have paid particular attention. Although brought to Japan about the sixth century by priests and scholars who had gone to China to study the Buddhist religion, it was not until about the seventeenth century that the morning-glory received any special attention. Flowers then began to be produced in innumerable shades and combinations of colors and the size was considerably increased. About 1830 the "asagao" again became popular, growers vying with each other in producing new varieties, and a single seed might command a price of twenty-five dollars or more. Interest gradually declined, however, and the art of cultivating this plant was retained only by a few priests. About 1895 interest was again revived, "asagao clubs" were formed, and famous morning-glory gardens were established in Tokyo. Poetic names, such as frozen moonlight, foam of the sea, dragon's spume, full moon, were bestowed upon the finest blossoms; artists used them in paintings and designs; and numerous poems were written on them and to them. In fact, the morning-glory became a national cult even more than the chrysanthemum had ever been. The Japanese growers went to every possible extreme in changing the shape and color of the flowers. Not being satisfied with this achievement, they devoted their attention to producing the greatest variety of odd-shaped leaves, and in their quest for eccentricities produced flat stems which have the appearance of a wide-ribbed ribbon, as if many stems were laid side by side and then merged into one. The "asagao" was not

only popular because of the wide range in size and color of the flowers but because the plants could be grown as "dwarfs." The common morning-glory, so well known about St. Louis, which climbs many feet before producing a flower of inferior size, is a marked contrast to the dwarf Japanese types shown in plates 14–16.

Attempts have repeatedly been made to show these Japanese morning-glories at the Garden, but all the seed obtained either failed to germinate or produced the common types of this country. In the early part of this year, however, seed of these dwarf morning-glories were obtained from Japan through Mr. Takashi Matsumoto, a former student in the Shaw School of Botany. This seed was divided, one-half being sown the middle of February and the second half the beginning of June. The seeds of the first lot germinated very unevenly, but by cutting a notch in those seeds that failed to show signs of life in two weeks the majority were made to develop. Most of these plants were extremely dwarf, sometimes being less than a foot high with not more than half a dozen leaves. These tiny plants produced the most gorgeous-colored flowers, often four to five inches in diameter. Seeds from these flowers did not set freely, but the few that were secured were planted as soon as mature. In the second generation, however, instead of dwarf specimens, plants were produced that climbed fifteen feet and more. The size of the flowers was not diminished, some of the pink varieties measuring six inches in width. Still more interesting and peculiar is the fact that the second planting of the original lot of seed received from Japan, which was made the first week in June, instead of producing dwarf plants, sent out long vines so that the bamboo trellises, described in the Japanese instructions, had to be employed to train them. In order that germination might be hastened every seed of this second lot was cut, and practically all germinated within forty-eight hours.

The following directions, printed just as translated by Mrs. Matsumoto, were received with the seeds:

"CULTURE OF THE MORNING-GLORY"

"In order to meet the requirements for growing the morning-glory, the soil must be superior in two respects, drainage and fertility. Under no circumstances use heavy clay.

JAPANESE MORNING-GLORY BLOSSOM

JAPANESE MORNING-GLORY PLANT

"The time of sowing is entirely governed by the climate, and it is very important that the growers should be acquainted with their local climatic conditions before growing these special plants. For the vicinity of Tokyo the sowing season generally starts in the middle of May or a little earlier. In general, the plants grow much better in warm places; therefore, the growers should not sow the seeds until they feel quite sure that warm weather has come to stay and there is no fear of frost injury.

"There are two types of seed-beds. The one is by sowing the seeds in a framed bed, and the other is by sowing them in a pot.

"1. Framed beds. For this purpose the bed should be well ventilated and sunny. It is very convenient to make the beds about three feet in width, but their length may be of any desired extent. Simple culture frames of usual type are employed, except that no glass cover is used, and their height is usually about five inches.

"Place the frames where the seeds are to be sown, and fill them with well-drained soil (about three to four inches deep) by sifting. Smooth the surface and sow the seeds on the bed and cover the surface with sifted soil (about ¼ inch in thickness), and sprinkle water, using only very small streams. It is a good practice to place a thin layer of straw upon it, and allow it to remain until the young plants appear at the surface of the bed. For the purpose of forcing, it is desirable to peel a tiny bit of the seed-coats before sowing. The right place for peeling is near a sunken spot where the germination takes place. Under a favorable condition the seeds begin to germinate in three to four days. When the casing soil is too shallow, the cotyledons will sometimes appear covered by the seed-coat. In such cases those coats should not be taken away when they are dry, as it often causes some injury to the cotyledons.

"II. Potted beds. In potted culture practically a similar method can be applied, with the exception that pots instead of frames are used.

"Transplanting: A seedling should be transplanted twice; first, from the seed beds, either framed or potted, to a small pot (about 2½ inches in diameter)—the purpose of the first transplanting is to prevent the unnecessary growth of the plants; second, remove it to a larger pot, usually 5 to 6 inches

in diameter. The first transplanting begins immediately after the cotyledons have opened. If the plants are left in the beds too long, it is very difficult to transplant them without giving any injury to the roots and cotyledons. As a matter of fact, it is very much desired by growers to keep the cotyledons on the plants until the flowering season; therefore, the growers should take much pains to keep them as long as possible.

"Fertilizers: Rape cake is generally used as a fertilizer, which is frequently applied to the soil in the form of powder, but mostly in liquid, which is thoroughly fermented. Chili saltpeter, ammonium sulphate, or potassium sulphate, etc., is frequently used as a substitute of the first named.

"Watering: The seed-beds should be always moistened until the young plants appear on the ground. After transplanting it is a usual practice to water twice a day, one in the morning and the other in the day time. It is desirable to use warm water for the day-time watering.

"Supports: When the plants grow up to 6 or 7 inches high, it is absolutely necessary to furnish some supports. For this purpose bamboos or reeds are generally used. The supports are arranged in various ways, of which the following two are very common:

"A, 'Andon' type (Lantern type).

"B, 'Boshi' type (Hat type).

"A. Andon type. Height of the supports is dependent upon the individual tastes. Erect four or five bamboos or reeds along the inside of the pots, and connect them with three rings of bamboo.

"B. Boshi type. A piece of bamboo is bended down to the soil, thus making an arch-like form, which is then crossed with two pieces of bamboo. This type of support is especially recommended for some special varieties which have hard stems.

"For the morning-glory culture it is a matter of most importance to help the stem of the plants to climb up the supports. The most desirable time for winding the stem is during day-time, as it is very tender, while in the morning or evening it is very brittle and could not be wound without causing any injury to the plants. The stems naturally twine the supports from left to right, therefore it should be arranged in that way, otherwise the stem may refuse to twine the supports.

SHOWING METHOD OF PACKING GIANT CACTUS

"Try to wind the stem, in the basal ring, and when it returns to the starting point, then lead it along an erect bamboo to the second ring, and wind the stem in the same way as stated above. It is desirable to check the growth of the plants when their stem encircles the second ring, and never let it grow further up to the third ring.

"Flowers usually bloom early in the morning and may wither soon when they are exposed to strong sunshine. The withered flowers should be picked at about ten o'clock every morning. For the purpose of getting seeds for next year, however, it is without saying to leave the withered flowers on the plants."

THE GIANT CACTUS (*Cereus giganteus*)

One of the most interesting plants in the semi-arid regions of Arizona and Mexico is the giant tree cactus (suwarro). In its native habitat it grows into a large columnar specimen, usually single, but frequently with one or more branches and rarely cristate in form. It may attain a height of sixty feet and weigh several tons. In spite of its great weight and the fact that it is comparatively short-lived under cultivation large specimens are sometimes shipped to botanical gardens.

In 1914 (see July, 1914, number of the BULLETIN), a large specimen of the giant cactus was obtained from Arizona and planted in one of the old greenhouses at the Garden. With the construction of the large conservatories it was again successfully transplanted to the present succulent house, where it flourished for several years. In 1919 a number of greenish flowers were produced from near the apex of the plant. This flowering, however, proved to be a sign of decay, for during the latter part of the year, in spite of treatment, the great mass of plant rotted, leaving only its many perpendicular fibro-vascular bundles. These woody supports reminded one of the reinforcing rods of a concrete column under course of construction, and it is easy to understand how a plant conforming to such an engineering plan could maintain an erect position to almost any height.

In view of the popular interest in this cactus, another giant was recently obtained by exchange through Mr. W. T. Swingle, of the Bureau of Plant Industry. The method

of packing and shipping these armored giants is a matter of considerable importance, both to the collector and the gardener who has to establish this huge spine-covered mass in its new location. The plant previously obtained was packed loosely in a large box with only enough straw around it to prevent injury during transit. The unpacking and handling of this naked plant until it was finally established in the greenhouse was an experience still remembered by those concerned with it. This method of packing was greatly improved upon in shipping the recently received specimen, and thanks are due to Mr. A. R. Leding of the Bureau of Plant Industry, who superintended the work.

The plant selected in Arizona for the Garden stood eight feet high and weighed approximately eight hundred pounds. It was packed before being dug in such a manner that planting could be accomplished without removing the protective covering. After first wrapping the spiny ribs with burlap, a layer of straw was applied and the plant braced with strips of wood extending a little beyond the roots and top. Several more inches of straw were then added, then another covering of burlap, and the entire packing made secure with rope. No box was necessary, since the plant could now be handled with ease during transit, and after arrival in St. Louis it was carried into the greenhouse just as it came from the freight car, and placed in a hole previously dug for its reception. The packing was not removed until after the cactus was securely fastened in its permanent position, thus preventing any injury to the men from the thousands of needle-like spines (pl. 17).

MEDICINAL PLANTS OF OUR LOCAL FLORA.

All the plants mentioned in this article, or preparations made from them, were once obtainable from pharmacists and some of them are still in common use. While most of those listed were at some time considered to be of medicinal value, comparatively few are now recognized as being officinal by the United States Pharmacopoeia. Synthetic preparations have replaced many of the old household remedies, and discoveries made by modern medicine are responsible for the abandonment of other plant products formerly supposed to have healing qualities. However, in spite of this fact the

Garden still has inquiries concerning the medicinal value of many of our local plants, and it seems worth while to bring together in some definite form a list of the plants of Missouri which in former times, at least, composed a considerable part of the *materia medica.*

I. HERBACEOUS PLANTS

Achillea Millefolium, yarrow.

At one time this plant had much reputation in the cure of wounds, but is now seldom used for this purpose. It was also used in intermittent fevers, hemorrhages, and abortion. It is said to be a stimulant, tonic, and astringent.

Acorus Calamus, calamus.

The root of calamus is an aromatic which causes a sensation of warmth in the stomach, improves the appetite, and aids digestion. It is chiefly used as an adjuvant of other more powerful remedies. In India it is deemed so valuable in diseases of the stomach and bowels that a penalty is inflicted on any druggist who will not dispense it at whatever time it may be called for. The Arabians and Persians consider it to be powerful in allaying pains of the stomach. The Turks make a confection of calamus, which is regarded as a preventive of contagion.

Actaea spicata, white baneberry.

The rhizome of the baneberry is a violent purgative, and the berries are poisonous. The plant is seldom employed internally, but a decoction from it is said to cure itch when applied externally.

Adiantum pedatum, maidenhair fern.

The leaves are used in a decoction or syrup. It has a bitterish aromatic taste but has been esteemed for diseases of the chest and lungs.

Agrimonia parviflora, agrimony.

The whole plant contains small amounts of tannin, and is used in cases requiring a simple vegetable astringent.

Agropyrum repens, couch-grass.

The creeping roots of this grass is a tonic and has been used as a substitute for sarsaparilla, also as a remedy in dropsy and in organic diseases of the thorax and stomach.

Ambrosia artemisiaefolia, ragweed.

A plant with a disagreeable odor and aromatic bitter taste. It is said to be a stimulant, tonic, and astringent, and has been employed domestically in chronic catarrh. The leaves and tops are used commonly in a decoction.

Anthemis Cotula, May-weed.

This plant has a very disagreeable odor, and when fresh a bitter acrid taste. It is used as an emetic, tonic, and stimulant.

Apocynum cannabinum, Indian hemp.

The root is used in dropsy and in other diseases where elimination of poisonous substances is required. It acts both as a purge and as a generator of perspiration.

Aralia nudicaulis, spikenard.

The root is a mild stimulant and has been employed as a substitute for sarsaparilla. It has been used in rheumatic affections, and a watery infusion of it as a tonic in dyspepsia.

Arctium Lappa var. *minus*, burdock.

The root of burdock was at one time much used in rheumatism and gout, also for diseases of the skin. The seeds are said to act as a purgative, and the juice of the leaves mixed with oil forms a soft ointment used as an external application to ulcers.

Arisaema Dracontium, dragon-root.

The root is acrid, stimulant, expectorant and carminative.

Arisaema triphyllum, Jack-in-the-pulpit.

The whole plant and particularly the corm is acrid. It has been used for colic, sore mouth, and rheumatic pains.

Aristolochia Serpentaria, Virginia snakeroot.

The root was much used by the Indians as a remedy for snake bites, and was soon adopted by the early settlers as an excellent tonic and stimulant. It is said to act as a stimulant to the digestive organs, and has been popular as a tonic in fevers and as a producer of perspiration in various ailments.

Artemisia vulgaris, mugwort.

Much used in some parts of Europe as an emmenagogue and antihysteric and by some German practitioners in the treatment of epilepsy.

Asarum canadense, wild ginger.

The root, which is the part employed, is an aromatic stimulant resembling *Aristolochia Serpentaria*.

Asclepias incarnata, swamp milkweed.

The tincture made of this plant was formerly used for cancer. The root has been used in cases of catarrh and asthma.

Asclepias syriaca, milkweed.

Used in asthmatic affections, rheumatism, and catarrh. It acts as an anodyne, relieving pain and inducing sleep.

Asclepias tuberosa, butterfly-weed.

The root is said to possess a remarkable power in affections of the skin, inducing general perspiration without increasing greatly the heat of the body. Also employed in pleurisy, rheumatism, and typhoid fever.

Asparagus officinalis, asparagus.

A syrup made from the juice has been thought to exercise a marked power in repressing an undue excitement of the circulatory system and is deemed useful in hypertrophy of the heart.

Aspidium Felix-Mas, male fern.

The resinous oil obtained from the roots of this fern has been considered the most efficient remedy for the elimination of the tape-worm.

Avena sativa, oat.

Oat flour, used with linseed flour, has been used as an emollient application to painful tumors.

Cannabis sativa, hemp.

Hemp, when fresh, acts as a powerful narcotic, but this property is considerably diminished if the plant is dried or kept long. It has none of the unpleasant after-effects of opium, for which it is often used as a substitute to relieve pain, allay spasm, and produce sleep. It is, however, much less certain in its effects than opium.

Caulophyllum thalictroides, blue cohosh.

The rhizome and rootlets were used by the Indians and their imitators for rheumatism, dropsy, colic, sore throat, cramps, hiccough, epilepsy, and hysteria.

Chelidonium majus, celandine.

This plant had a reputation of being particularly useful in the removal of obstructions of the liver and in promoting expectoration. Externally it was used for sore eyes, rheum, and also for ringworm and scurvy eruptions.

Cimicifuga racemosa, black snake-root.

The root of this plant was much used by the Indians as an antidote against the bites of venomous snakes. It is a stimulating tonic, and used in decoction is capable of increasing the secretions of the skin, kidneys, and lungs; also used for rheumatism.

Convolvulus arvensis, bindweed.

The root is diuretic and purgative; the leaves emetic and cathartic.

Corallorhiza odontorhiza, coral-root.

The root is said to be a prompt and efficient diaphoretic.

Cucurbita Pepo, pumpkin.

The macerated root has astringent properties, and is sometimes used for piles.

Cuphea viscosa, cuphea.

Used in intermittent fevers.

Cypripedium pubescens, yellow lady's-slipper.

The roots of this plant have been held in high esteem in alleviating nervous symptoms, and are said to have proved very useful in hysteria.

Datura Stramonium, jimson-weed.

Datura Tatula, purple jimson-weed.

The effect of these plants is very similar to that of belladonna. In overdoses it causes nausea, delirium, drowsiness, cold sweats, and convulsions.

Delphinium Ajacis, larkspur.

A decoction of the flowers has been used for affections of the eye. Tincture of the seed has been recommended as a vermifuge, also for the destruction of lice in the hair. The plant was formerly of some repute as a medical agent in various diseases.

Dicentra canadensis, squirrel corn.

The roots are diuretic, diaphoretic, and sedative. The plant is sometimes used as a substitute for mercury in venereal diseases.

Dioscorea villosa, wild yam.

A tincture of the roots is used as an expectorant and diaphoretic, and a decoction of the root is said to be beneficial in bilious colic.

Echinacea angustifolia, narrow-leaved purple cone-flower.

An extract from the root of this plant was used hypodermically in extreme cases of blood poisoning, also externally for cuts and sores.

Equisetum hyemale, horsetail.

This plant is diuretic, astringent, and tonic.

Erechtites hieracifolia, fire-weed.

The flowering tops yield a volatile oil which is said to be tonic, astringent, and alterative, and to exert a special influence upon the mucous surfaces. It has been used as a remedy for dysentery.

Erigeron canadensis, Canada flea-bane.

The whole plant, administered as a decoction, was used as an effective diuretic in diseases of the bladder and kidneys, also in dropsy.

Eupatorium perfoliatum, boneset.

Boneset was known to the Indians, by whom it was much esteemed in the dispersal of fevers. It also became a favorite remedy of the early settlers. Many properties have been attributed to this plant, and if true, it would be a curative for nearly all diseases.

Eupatorium purpureum, gravel-root.

As its common name indicates, this plant has been much used in diseases of the kidney and bladder.

Euphorbia corollata, flowering spurge.

The root is diuretic, diaphoretic, expectorant, emetic, and was used in the treatment of dropsy. The juice is cathartic, antisyphilitic, poisonous, and the leaves are astringent, tonic, and narcotic.

Euphorbia hypericifolia, upright spurge.
Euphorbia maculata, milk purslane.

These plants possess the same properties as *Euphorbia corollata*.

Eryngium aquaticum, button snakeroot.

This plant has been used with some success as a diaphoretic and expectorant. In large doses it proves emetic. The root, which is the part used, is pungent, bitter, and aromatic.

Fragaria virginiana, wild strawberry.

The fruit is said to have medical properties and was used by Linnaeus as a remedy for gout. The leaves are somewhat astringent.

Galium aparine, bedstraw.

The plant, in decoction, has been used in many diseases of the urinary organs, in scaly affections of the skin, and in cancer.

Geranium maculatum, wild crane's-bill.

The root is a powerful astringent, and was known and used as such by the Indians. It has been used in dysentery, aphthous affections of the mouth and throat, and cholera infantum.

Glechoma hederacea, gill-over-the-ground.

This plant has been used in catarrhal affections and in pulmonary consumption.

Gnaphalium polycephalum, everlasting.

Flowers and tops used in catarrhal affections, also as a tonic.

Grindelia squarrosa, gum-plant.

The fluid extract of the leaves and flowering tops has been found beneficial in chronic catarrhal affections, also in spasmodic asthma and in whooping cough, especially when complicated by bronchitis.

Hedeoma pulegioides, pennyroyal.

Pennyroyal is a stimulant aromatic, and is used to obviate nausea as well as to disguise the taste of nauseous medicines. It is largely employed in domestic practice. The medical properties are contained in an essential oil.

(*To be continued.*)

NOTES

Two little blue herons were seen at the lake in the North American tract on August 8. These somewhat rare visitors are native of Florida and doubtless were on their way home from northern breeding grounds. Another important bird visitor was the black-and-white warbler which was seen at the Garden on September 11th. While he is a common bird during the second migration, he is seldom seen here on his return trip in the fall.

Visitors to the Garden during the summer months include Professor A. L. Herrera, director of the Biological Station of Mexico; Professor A. C. Burrill, professor of entomology and plant pathology, University of Missouri; Professor H. M. Fitzpatrick, professor of plant pathology, Cornell University; Miss E. H. Smith, of the department of plant pathology, University of California; Mr. John C. Dunegan, plant pathologist, U. S. Department of Agriculture; Dr. G. R. Hill, director of the School of Agriculture and professor of botany, Utah Agricultural College; Mr. Gerardo Offimaria Ocfemia, of the department of plant pathology, University of the Philippines, Los Banos.

Volume VIII, No. 4, and Vol. IX, No. 1, of the Annals of the Missouri Botanical Garden have recently been issued, with contents as follows:

Vol. VIII, No. 4—"The Sizes of the Infective Particles in the Mosaic Disease of Tobacco," B. M. Duggar and Joanne L. Karrer.

"Tilletia texana in Missouri," H. R. Rosen.

"Some North American Tremellaceae, Dacryomycetaceae, and Auriculariaceae," E. A. Burt.

Vol. IX, No. 1—"Some North American Species of Clavaria, with Illustrations of the Type Specimens," E. A. Burt.

STATISTICAL INFORMATION FOR JUNE–AUGUST, 1922

GARDEN ATTENDANCE:

Total number of visitors in June	19,919
Total number of visitors in July	23,329
Total number of visitors in August	22,021

PLANT ACCESSIONS:

Total number of plants and seeds received in exchange in June	206

PLANT DISTRIBUTION:

Total number of plants distributed as gifts in August...	4

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought in June..	14
Total number of books and pamphlets donated in June..	21
Total number of books and pamphlets bought in July...	29
Total number of books and pamphlets donated in July..	57
Total number of books bought in August.....	17
Total number of books and pamphlets donated in August	187

JUNE

HERBARIUM ACCESSIONS:

By Gift—

Bartholomew, E.—*Polyporus dichrous* Fr. from Texas..	1
Brinkman, H. A.—*Triosteum aurantiacum* Bicknell from Illinois.....	1
Burke, Dr. R. P.—Clavarias from Alabama.....	6
Drushel, J. A.—Plants of New York, Alabama, Ohio, Missouri, Texas, Colorado, Washington, and California.....	57
Mitchell, Dr. F. L.—*Achillea lanulosa* Nutt. from South Dakota.....	1
Ober, Mrs. William A.—*Gardenia* sp., greenhouse specimen.....	1
Rose, Dr. J. N.—Photograph of *Coryphantha* sp.....	1
Stiehl, E. P.—*Arisaema Dracontium* (L.) Schott. from Illinois.....	1
van der Bijl, Dr. P. A.—Fungi of South Africa.....	15
von Schrenk, Dr. Hermann—Specimens of "tupelo," "black," and "red" gum and of pine from Louisiana..	8
Zeller, Dr. S. M.—Fungi of Oregon.....	29

By Exchange—

Gray Herbarium of Harvard University—Plants of Nova Scotia, Maine, New Hampshire, Massachusetts, and Rhode Island.....	134
Schallert, Dr. P. O.—Mosses, hepatics, and lichens of North Carolina.....	96
University of Wisconsin, by Dr. J. J. Davis—"Fungi Wisconsinenses exsiccati" Decade XI, Nos. 101-110...	10

By Purchase—

Hanson, Herbert C.—Plants of Colorado.....	312
Koch, Max—Plants of Australia and New Zealand.....	155
	828

JULY

By Gift—	
Aiken, Walter H.—Umbelliferas plant from Nevada....	1
Deane, Walter—Plants of Maine and Massachusetts, collected by Hon. J. R. Churchill.....	164
Palmer, Ernest J.—*Isoetes* sp. from southwestern Missouri.....	2
Rose, Dr. J. N.—Photograph of *Mammillaria lasiacantha* Engelm.....	1
Terry, Mrs. C. E.—*Phlox caespitosa* Nutt. from Colorado	1
von Schrenk, Dr. Hermann—Fruiting specimens of *Nyssa* or "gum" from South Carolina.....	3
By Purchase—	
Grout, A. J.—North American Musci Pleurocarpi, Nos. 476-488 inclusive.....	13
	185

AUGUST

By Gift—	
Davis, David—*Polemonium confertum* Gray from Utah	1
Johnston, Mrs. Robert L.—*Navaretia squarrosa* Hook. & Arn. from Missouri (introduced).....	1
Petch, T.—Thread blight Corticiums of Ceylon.....	3
Snell, Dr. W. H.—Wood-destroying fungi of mills.....	11
von Schrenk, Dr. Herman—*Pinus* sp. from Louisiana	5
Walker, Prof. Leva B.—*Exobasidium Vaccinii* on fruits of *Arbutus Menziesii*, Friday Harbor, Washington...	1
Whetzel, Dr. H. H.—Fungi on mosses.....	3
By Purchase—	
Davis, Rev. John—Plants of Vermont, New Mexico, New Jersey, Texas, etc.....	371
Nijhoff, Martinus—W. Migula's "Kryptogamae Germaniae Austriae et Helvetiae exsiccatae," Fasc. I-XXXIV.....	850
Nijhoff, Martinus—Sydow's "Mycotheca germanica," Fasc. XXIX-XXXVI, Nos. 1401-1800 inclusive.....	400
By Exchange—	
Clokey, Ira W.—Plants of Colorado.....	208
New York Botanical Garden Herbarium, by Dr. W. H. Murrill—Set of species of *Poria*, including portions of types and authentic specimens.....	106
	1960
Total	2973

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from November to April, 1:00 P. M. until sunset, from April to November, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

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MISSOURI BOTANICAL GARDEN BULLETIN

Vol. X OCTOBER, 1922 No. 8

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NYMPHAEA "MRS. G. H. PRING."

Missouri Botanical Garden Bulletin

Vol. X St. Louis, Mo., October, 1922 No. 8

HYBRID NYMPHAEAS

The cultivation of the water-lily is one of the oldest branches of floriculture, dating back to 3000 B. C. when the flowers were used by the ancient Egyptians in religious ceremonies as well as for utilitarian purposes. In 1884 the German botanist, Schweinfurth, found petals of the white *Nymphaea Lotus*, of nocturnal habit, and *N. caerulea*, of diurnal habit, in the funeral wreaths of Rameses II, and water-lilies were commonly used for funeral decorations in the nineteenth and twenty-first dynasties, the custom being to place wreaths and semi-circles of the flowers on the breast of the wrapped corpse. Schweinfurth compared his collections from the ancient tombs with the present-day Egyptian lotus and was unable to detect any difference. Hence the conclusion arrived at is that the species is not undergoing transmutation, or if it is that the changes are infinitely slow, one of the contributing factors probably being that the climate of Egypt is very nearly the same as it was 4000 years ago.

The development and improvement of the water-lily from the original plant is of comparatively recent date, the first hybrid, *N. devoniensis*, having been grown in 1851 by Paxton, the eminent gardener to the Duke of Devonshire. He also built special aquatic houses for the cultivation of tropical water-lilies, thus arousing popular interest in the subject in Europe. In view of the tropical climatic conditions in St. Louis during the summer, special aquatic greenhouses are unnecessary, since it is possible to grow outdoors plants far superior to those produced in European greenhouses. Within the past eight years, at the Missouri Botanical Garden, the area devoted to water plants has been increased from two small ponds capable of growing approximately two dozen

plants, to the present accommodations consisting of the pools in formal setting between the main entrance and the large conservatories, the natural ponds among the knolls, and the pools west of the Italian garden, in all of which combined over two hundred plants are grown during the summer. The Garden collection, including the many new hybrids, is conceded to comprise the finest tropical day-blooming varieties in the country.

× NYMPHAEA "MRS. G. H. PRING" PRING
NEW WHITE-FLOWERED HYBRID
(*N. ovalifolia* × *N.* "Mrs. Edwards Whitaker")

According to commercial growers there is an increasing demand by the public for a tropical white day-blooming lily of large size. Up to the present time all tropical day-blooming water-lilies have ranged in color from pink to blue, with one exception, the species *Nymphaea gracilis*. The African species, *N. ovalifolia*, of recent introduction, has white flowers shaded with blue and pink at the apex of the petals. In 1919 experiments were started at the Garden with the object of producing the much-needed albino hybrid. Stock of *Nymphaea* "Mrs. Edwards Whitaker" was selected as a desirable parent, in view of the pale campanula-blue flowers bleaching to pure white with age, a factor transfused through its parent, *N. ovalifolia*. The seed parent was between *N. gracilis* of Mexico and *N. ovalifolia*. Hybrids from *N. gracilis* in cultivation have not improved the offspring in size to the same degree as *N. ovalifolia*, nor has the white proved a recessive character in the second or third generations. In fact, experiments at the Garden with *gracilis* hybrids did not produce type *gracilis* or revert back to it (see Ann. Mo. Bot. Gard. vol. 4, p. 1). *Nymphaea ovalifolia* crosses so far have brought forth type *ovalifolia* in the second generation. *Nymphaea ovalifolia* was therefore selected as the other parent. Reciprocal crosses were made between *N.* "Mrs. Edwards Whitaker" and *ovalifolia*, producing varieties like the parent "Mrs. Edwards Whitaker." *Nymphaea ovalifolia* × "Whitaker" gave the desired result, producing both albino and Whitaker varieties. The best-flowered seedling showing Whitaker-shaped petals with white as the dominant factor was selected

NYMPHAEA "HENRY SHAW."

NYMPHAEA "AUGUST KOCH," SHOWING VIVIPAROUS LEAF GROUP IN THE FOREGROUND.

as the type flower, the foliage likewise showing Whitaker influence. This was carefully self-pollinated during 1920, the seedlings bringing forth albino flowers the next flowering season. In 1921 the finest plant was again selected and self-pollinated, producing the same type of flowers the following season. The desired hybrid was obtained by selection during three years, thus proving that the white coloration is fixed, provided of course that all foreign pollen is excluded.

It having been proved that the flowers had finally reached a stage of development superior to the white-flowered *N. gracilis*, specimen flowers were submitted to the Society of American Florists and Ornamental Horticulturists in convention at Kansas City, August 15, 1922, and the lily was awarded honorable mention. Mr. Charles Tricker, water-lily specialist of Arlington, N. J., visited the Garden after the convention, in the capacity of official judge, to report on the condition of the entire plant as growing in the pool. He stated that "the new hybrid presents the biggest one jump in the development of a new water-lily to date." The size of the flowers varies from eight to ten inches in diameter. A description of the lily will appear in a forthcoming issue of the Annals of the Missouri Botanical Garden.

× NYMPHAEA "HENRY SHAW" PRING

(*N. castaliiflora* × *N. castaliiflora*)

This hybrid, named in honor of the founder of the Missouri Botanical Garden, has been shown in the Garden collection annually since 1917, and during its flowering period is invariably pronounced by visitors to be the most beautiful of the blue water-lilies. One of the foremost growers in the East, on a recent visit to study the Garden collection, expressed his opinion that this variety had great merit from a commercial viewpoint.

The plant dates from 1917, having appeared in the second generation of *N. castaliiflora* (see Pring, Hybrid Nymphaeas. Ann. Mo. Bot. Gard., vol. 4, p. 3), the blue color being recessive and aggregating about two per cent. It is of interest that later experiments of self-pollinating "Mrs. Edwards Whitaker" yielded this same recessive blue-flowered type (*N. castaliiflora* being the staminate parent of *N.* "Mrs.

Edwards Whitaker''). In general characteristics the ''Henry Shaw'' is a replica of *N. castaliiflora*, in fact to such an extent that it is impossible to tell one from the other until the flowering period. The flowers are light campanula-blue. The petals and stamens are the same in number, the latter being light campanula-blue at the apex and lemon-chrome below. The sepals are prominently hooded and solid green on the back, all dark markings being absent. The seedling leaves are prominently marmorate on the upper surface, while the developed leaves, like those of the parent, are flushed with pinkish red on the under side, the upper surface being green sparsely spotted with light brown.

× NYMPHAEA "AUGUST KOCH" PRING

(*N. pennsylvanica* × *N.* ''Mrs. Woodrow Wilson'')

This interesting viviparous hybrid was produced through insect agency from seed of *Nymphaea pennsylvanica* collected at Garfield Park, Chicago. Four of the plants were sent to the Garden in the fall of 1921 to be grown for identification during the following summer. All of the plants have fully developed characters which suggest the hybrid *N.* ''Mrs. Woodrow Wilson'' as the staminate parent, but the purple markings dominant on the bud of both parents is entirely absent. The leaves are a replica of those of ''Mrs. Woodrow Wilson,'' the under side being flushed with pink, contrasting with the green venation, and the upper surface being green and bulbiferous at the summit of the petiole. Two of the specimens show the sinus lobes overlapping, while the remaining two are open. The flowers of the open-lobed plants are slightly lighter in color. The darker-flowered variety has been selected as the type.

Description.—Flowers 7–8 inches across, opening 4–5 days during August, fragrant; bud ovate to ovate-conical, light green; peduncle rising 8–10 inches above the water, in cross-section showing 7 main air-canals surrounded by 14, these again by smaller ones; sepals 4-wedged, ovate, 3–3½ inches long, 1½ inches wide, somewhat hooded at the apex, thick, fleshy in texture, outer surface green margined with purple, inner surface pink suffused with blue, light green at the base, showing 12–14 nerves; petals 32–35, outermost whorl lance-

olate, obtuse, 3 inches long, 1 inch wide, dark blue, externally channeled longitudinally with green, thick in texture except along the margins, 8–9-nerved, inner whorls blue; stamens 180–190, outermost whorl 1½ inches long, with yellow appendages ovate-oblong at the base, the linear portion blue, inner whorls shorter and narrower toward the innermost which is linear and blue at the apex; carpels 30–35, with styles oblong, obtuse, introrse; fruit globose, containing numerous fertile seeds; developed leaves peltate, orbicular, 14 inches across, deeply obtuse, sinuate, green on the upper surface, bulbiferous at the summit of the petiole, pinkish green beneath, sinuses overlapping, terminating in acuminate lobes; petioles terete, brownish green, 3–4 feet long.

FLORAL COLOR STANDARDS FOR NYMPHAEAS

The identification of the many hybrid nymphaeas by the present published color standards is extremely unsatisfactory and misleading. In some hybrids there are several shades within the petals, while in others the sepals are of a different shade from that of the petals. The life of the open flowers varies from three to five days, depending upon the month of flowering, and during this period there is a decided range in color between the first and last day. This is very striking in *Nymphaea* "Mrs. Edwards Whitaker" which is a pale campanula blue on the first day of opening and gradually bleaches to white on the last day. A comparison of the fresh and old flowers of the night-bloomers, especially the darker varieties, also shows considerable variation in color.

The base color in the three distinct groups of stamens is identical, being a lemon-chrome, and the apical portion of the anthers is tinted the same color as the petals. The dark-flowered night-bloomers usually have stamens of darker color, whereas the lighter-flowered varieties, such as *N. Omarana*, show lemon-chrome as the dominant color, the exterior basal portion of the outer whorls having the same coloration as the petals. The varieties growing in the Garden, comprised in the following list, have been standardized according to the charts in Ridgway's "Color Standards and Nomenclature." All flowers were judged on the first day of opening.

NYMPHAEAS GROWING IN THE GARDEN COLLECTION COLOR STANDARDS ACCORDING TO RIDGWAY

Variety	Color of flowers
TROPICAL NOCTURNAL	
"B. C. Berry"	Amaranth Purple, base of petals lighter
"C. E. Hutchings"	Tyrian Rose
devoniensis	Amaranth Pink
"Frank Trelease"	Tyrian Pink
"George Huster"	Rhodamine Purple
"H. C. Haarstick"	Rose
"J. S. Walsh"	Hermosa Pink
"James Gurney, Jr."	Amaranth Purple
Kewensis	Rose Pink
Lotus gigantea	White
Omarana	Rose Pink
tulipifera	Rosolane Purple
TROPICAL DIURNAL	
"August Koch"	Sepals, Purplish Lilac, petals, Pale Wistaria Violet
castaliiflora	Mallow Pink
"C. W. Ward"	Laelia Pink
"General Pershing"	Pale Rose Purple
gracilis	White
"Henry Shaw"	Light Campanula Blue
"Mrs. Edwards Whitaker"	Pale Campanula Blue, bleaching to white with age
"Mrs. G. H. Pring"	White
"Mrs. Woodrow Wilson" var. gigantea	Sepals, Dull Lavender, petals, Light Campanula Blue
ovalifolia	White, flushed with blue and pink
"Panama Pacific"	Sepals, Mathews Purple, petals, Lavender Violet
"Stella Gurney"	Pale Laelia Pink
"William Stone"	Chicory Blue
DOMESTIC (HARDY DIURNAL)	
"Attraction"	Sepals, base color Viridine Yellow, flushed with light Rosolane Purple
	petals, Amaranth Purple, shading deeper at the margins
"Escarboucle"	Sepals, base color Pale Viridine Yellow, flushed with light Rosolane Purple
	petals, Amaranth Purple

DOMESTIC (HARDY DIURNAL)—Continued	
Variety	Color of flowers
"Eugene De Land"	Rose Pink
"Formosa"	Sepals, White petals, Pale Amaranth Pink, shading to Amaranth Pink on the back
gloriosa	Sepals, White petals, Rosolane Purple on the outer whorls, Amaranth Purple on the inner whorls
"James Brydon"	Amaranth Purple
Marliacea chromatella	Pale Green Yellow
Marliacea rosea	Hermosa Pink
"Paul Hariot"	Sepals, Sulphur Yellow petals, base color Maize Yellow, flushed with Rose
odorata gigantea	White
Robinsonii	Sepals, Pale Viridine Yellow, flushed with Rose Pink petals, Rose
"Rose Arey"	Rose Pink
"Sioux"	Base color Maize Yellow, flushed with Rose
tuberosa Richardsonii	White
"Vesuve"	Sepals, Rosolane Purple petals, Amaranth Purple, shading deeper toward the margin

BULBS FOR THE HOME

From October to January florists' shops, seed stores, department stores, and even ten-cent stores display bowls and pots with growing bulbs. Many persons see them and wish to grow them but conclude that it is impossible and that the pleasure must be reserved for the professional grower. Some of those who buy the bulbs grow them successfully, but others are disappointed with the results they obtain. It is regrettable that more persons do not know how easily some bulbs, particularly the paper-white narcissi, can be grown in the house. Failure is sometimes due to poor culture and many times because the bulbs have dried out, especially if they have been in the very warm and dry stores for many weeks. The bulbs should be purchased as early in the season as possible and if all are not planted at once the remaining ones should be stored in a cool place. In purchasing the bulbs one should see that

they are firm and of good size, for the small and spongy ones usually will not produce flowers.

BULBS OF EASY CULTURE

Perhaps the simplest bulb to handle is the paper-white narcissus. It is one of the earliest varieties of the narcissi group but can be had in bloom for a long time by successive plantings at intervals of about a week. As for the medium in which to grow the bulbs, there is nothing simpler and cleaner than a shallow bowl of water containing pebbles to support the bulbs in an upright position. Plate 21 shows a shallow dish only one and one-half inches deep in which eight paper-white narcissi bulbs grew and flowered. In planting, a layer of pebbles is placed in the bowl, the bulbs set on this layer, and some pebbles packed about each one to hold it in place. The water should come barely to or a little above the base of the bulbs. With a large bowl it is recommended to change the water occasionally, but with a shallow one this is almost impossible without disturbing the pebbles and injuring the roots. If a few pieces of charcoal are placed in the bowl the water will be kept fresh, so that it will never have to be changed but only enough added to allow for evaporation. If any bulb should rot and thereby contaminate the water the affected bulb should be removed and the water changed, but this seldom occurs with narcissi unless the bulbs have been injured before planting.

The bowls containing the bulbs should be put in a cool dark place, a fruit cellar being an ideal location. The essential points to remember at this stage of the bulb growing are (1) that the storage place be kept dark to prevent the leaves from starting; (2) that it be kept cool, the roots then being able to grow before the tops; and (3) that the bulbs get plenty of air. In selecting a cool place a temperature of from fifty to sixty degrees will suffice, but it is better if it can be still cooler. Temperatures below freezing must be avoided. Sometimes a cool dark place is not available, and in that event a corner in a comparatively cool room can be darkened with a box and the bulbs placed in this. If the room is very cool root growth will not be as rapid as in a warmer room, but

PAPER-WHITE NARCISSUS.

HYACINTH, SHOWING HOW ROOTS DEVELOPED IN DARKNESS

when the bowl is well filled with roots it can be brought to the light. The leaves will then have started and may be a few inches long and white, and on that account the bulbs should be brought to the light gradually. After growth is well advanced they may be placed in a sunny window for a short time each day. Bulbs that are started in a cool place will produce a sturdy growth and the flowers will last longer than those that have grown rapidly in a very warm room. Narcissi treated in this manner can be had in flower from six to eight weeks from the time of planting.

Paper-white narcissi can also be grown in soil in pots under similar conditions. If a cool dark place is not available for storing the bulbs indoors a shallow trench may be dug in a well-drained place outdoors. In this trench from two to three inches of ashes should be placed for drainage, and on this the pots set so that the rims are about six inches below the surface of the soil. The trench should then be filled with soil and the surface mounded to shed water. As the weather becomes colder the soil should be covered with leaves or some other coarse material, this being held in place with boards. Four weeks is the shortest time the narcissi should be left outdoors, six or eight weeks being better. The bulbs should be planted in pots or pans, preferably the latter. A good quantity of broken crocks or stones should be placed in the pots for drainage, then a layer of good garden soil, and on this the bulbs set so that when the pot is filled with soil the necks of the bulbs will be barely visible. They should then be watered thoroughly and put in the storage place.

The Chinese sacred lily can be grown in bowls of water and pebbles, but not as successfully as the paper-white narcissus. The bulbs are much larger, deteriorate rapidly in the dry atmosphere of the stores, and cost considerably more than the paper-whites. It is therefore advisable for those who have never grown bulbs indoors to first try the narcissi and as cultural experience increases attempt growing the Chinese sacred lily.

The Dutch hyacinth is also readily grown in water, but it takes longer for the flower to develop and only one bulb may be grown in a glass. (Hyacinth glasses can be obtained at the seed stores.) Only the choicest bulbs should be pur-

chased and preferably named varieties. A piece of charcoal about an inch square should be placed in the glass to keep the water fresh, the bulb set in the cupped portion, and water added until it barely touches the base of the bulb. No pebbles are necessary, but water should be added occasionally to keep the level constant. The bulbs are then placed in a cool dark place, as with the narcissi, and should be left there until the glass is well filled with roots. The plants should never be placed in direct sunlight but brought to the light gradually. The hyacinth has the misfortune of being overanxious to grow, and occasionally the flowers develop so rapidly that the spike cannot get out of the bulb, or sometimes the leaves have grown so fast that when the flowers open the spike is down among them. The Dutch hyacinths may also be grown in pots of soil, in which case they are given practically the same treatment as the narcissi, care being taken that in planting the tips of the bulbs protrude just above the surface.

The Roman hyacinths are bulbs of the easiest culture, and success with them in pots of soil is more uniform than with the Dutch hyacinths. The bulbs are small, but many spikes of flowers come from each bulb. The flowers are loosely arranged along the spikes, giving a more graceful effect than the stiff Dutch hyacinth. They should be given the same treatment as other bulbs, but may be brought indoors sooner than the Dutch hyacinths.

What to do with the bulbs after flowering is a frequent question. Those that have been grown in water are of no further value, all of their energy having been consumed. The bulbs grown in pots, however, may be grown on until the leaves yellow which is an indication of the bulbs ripening. Water should then be withheld, and when all the foliage is dead the soil should be removed and the bulbs stored in a cool dry place. They may be planted outdoors in the fall where they will grow and eventually regain their strength, but they should not be used for forcing a second time as results are very unsatisfactory.

Tulips and other bulbs may be grown indoors, but results are not as satisfactory as with these described. If tulips are

ROMAN HYACINTH.

grown some of the best single varieties should be purchased, the catalogues usually indicating those suitable for forcing.

MEDICINAL PLANTS OF OUR LOCAL FLORA.

(Continued from September Bulletin)

Helianthus annuus, sunflower.

The seeds are diuretic and expectorant.

Hepatica triloba, liver-leaf.

The plant was formerly made into a tea, in which form it was esteemed in diseases of the chest and lungs.

Heuchera americana, alum-root.

The root was used domestically, in decoction, as an astringent in sore throat.

Humulus Lupulus, hops.

"Hops" are the pistillate flowers of *Humulus Lupulus* picked when fully ripe, and are thin, veined, leaf-like bracts or scales of a greenish yellow color. Their odor is strong and peculiar, somewhat aromatic and fragrant. Their taste is bitter and astringent. Hops are sometimes employed as a tonic and also are used to alleviate pain and induce sleep. A poultice of hops has occasionally been found useful in allaying restlessness and inducing sleep. An ointment made from them has been recommended as an application for cancerous sores. The properties of hops are contained in a resinous secretion from the fruit called lupulin.

Hydrastis canadensis, golden-seal.

The root of this plant was used by the Indians both as a dye and a medicine. It is a powerful tonic bitter. It has been much employed as a wash in chronic ophthalmia and other diseases of the eye, and also enters into the composition of some "cancer powders."

Hypericum perforatum, St. John's-wort.

According to early writers on medicinal plants St. John's-wort has many virtues as a medicine, and it is still much used domestically in Europe. In this country it has been made into an oil or ointment which was said to be an excellent application for ulcers and as an aid in the reduction of tumors.

Iris versicolor, blue flag.

The rhizome of the blue flag was a favorite remedy of the Indians of the southern states who used it in cases requiring purgation. As a purgative it is apt to produce great nausea and loss of strength, but it is said to be beneficial in dropsy.

Juncus effusus, bullrush.

This plant is diuretic, cathartic, and mildly astringent.

Lactuca canadensis, wild lettuce.

The leaves are supposed to be a remedy in cases of snake bite.

Lappa minor, burdock.

The root is diaphoretic and diuretic and at one time was much used in rheumatism, gout, and diseases of the skin. The seed are diuretic and purgative. The leaves have been used as an external application for ulcers.

Lemna minor, duckweed.

This plant is demulcent and used in poultices.

Leptandra virginica, Culver's root.

This plant is said to have antiscorbutic, diuretic, febrifuge, and vulnerary properties. It is sometimes used as a wash for ulcers.

Liatris cylindracea, rattle-snake's master.

Liatris pycnostachya, blazing-star.

Liatris scariosa, blazing-star.

The root of these plants was used extensively by the Indians in the treatment of bites of venomous snakes. The rhizomes were bruised and applied to the wound, while at the same time a decoction of the plants in milk was taken inwardly. Liatris was also valued for its diuretic properties.

Linaria vulgaris, butter-and-eggs.

The plant is cathartic and diuretic and was sometimes used in the treatment of diabetes.

Lobelia inflata, Indian tobacco.

Lobelia cardinalis, cardinal flower.

Lobelia syphilitica, great blue lobelia.

The whole plant of lobelia is endowed with active properties, but the leaves and capsules are preferred. It was used by the Indians as a medicine and in their ceremonies. It has been employed in asthma, croup, and whooping-cough, *L. inflata* being regarded as the most active.

Lycopus virginicus, bugle-weed.

The whole plant has been used in diseases of the lungs, for allaying irritations and preventing cough. It acts as a mild narcotic and tonic.

Malva rotundifolia, mallow.

This plant used as a decoction has been employed in domestic practice both internally and externally in inflammatory affections, also to soothe and protect tender tissues.

Marrubium vulgare, horehound.

The whole plant of the horehound is used. The dried herb is either made into a powder or into an infusion by boiling in water. It has been much used domestically for jaundice, asthma, and uterine obstructions, also in the manufacture of cough syrups and candy. It is tonic, somewhat stimulant, and in large doses gently laxative.

Medicago sativa, medick.

This plant is soothing and laxative.

Melilotus alba, sweet clover.

The flower of the clover is aromatic, emollient, expectorant, and diuretic.

Mentha piperita, peppermint.

Mentha spicata, spearmint.

The whole plant possesses medical properties. It is aromatic and stimulant and is sometimes used to expel flatus and to obviate nausea, relieve pain in the bowels, and to disguise unpleasant tastes of other medicines.

Monotropa uniflora, Indian pipe.

The root is bitter, astringent, and emetic. It was sometimes used in epilepsy.

Nepeta Cataria, catnip.

Nepeta Glechoma, ground ivy.

The plant has been used in domestic practice as a remedy for colic in infants, also for hysteria.

Nuphar luteum, nelumbo.

The root, leaves, and seeds are used, being said to possess refrigerant, laxative, diuretic and emollient properties.

Nymphaea odorata, sweet-scented water-lily.

The rhizome of this plant has been used as an astringent in dysentery, diarrhea, and catarrhal affections, in the last-named case both internally and locally.

Ostrya virginiana, hop hornbeam.

The bark is bitter, tonic, alterative, and antispasmodic.

Oxalis stricta, wood sorrel.

The leaves are reputed to be useful in scurvy and scorbutic affections. An infusion is refrigerant and has been employed as a cooling drink in febrile affections.

Panax quinquefolium, ginseng.

The root of the ginseng has attained great fame from the astonishing virtues attributed to it in China, where it is considered a cure

for all diseases. According to the Chinese authorities, "panacine," a peculiar substance of the plant, stops vomiting, nourishes and strengthens the body, clears the judgment, removes all nervous affections, and even rejuvenates the human frame in old age. Experiments in this country have shown the ginseng to be of no particular value.

Parthenium integrifolium, American feverfew.

The roót is aromatic, bitter, stimulant, diuretic, and tonic, and the tops are antiperiodic. The whole plant has tonic, carminative and vermifuge properties. It has been used in nephritis and inflammation of the bladder.

Phytolacca decandra, poke-weed.

The parts used in medicine are the leaves, berries, and roots. The leaves are somewhat purgative, but are principally employed in domestic practice as a dressing for ulcers. The berries have been used in scrofula and as an external application for cancerous sores. The root has been used, in small doses, in chronic rheumatism and chronic eruptions.

Podophyllum peltatum, May-apple.

The fruit of this plant was considered medicinal by the Indians, and the root was in common use as a purgative. An extract and powder made from the roots is sometimes used as a purgative even now.

Polemonium reptans, Jacob's ladder.

The root is alterative, pectoral, and diuretic.

Polygonum hydropiperoides, water pepper.

The herbage of this plant is employed in domestic practice, externally as a counter-irritant and internally to induce diaphoresis in acute inflammatory affections.

Polygonatum commutatum, Solomon's seal.

The rhizomes and rootlets are sometimes employed as a decoction in a domestic remedy to allay irritation of the mucous surfaces and in ivy poisoning where it acts by protecting the inflamed parts from the air.

Polymnia uvedalia, bear's-foot.

The plant is vulnerary, tonic, and antispasmodic.

Polypodium vulgare, common polypody.

Large doses of this plant have been used to produce mild purgation. It was highly esteemed by the ancients as a purgative in obstructions of the liver and was also supposed to be useful in gout and colic.

Portulaca oleracea, purslane.

The plant is antiseptic, diuretic, aperient, and vulnerary.

Prunella vulgaris, self-heal.

The plant is astringent, and is sometimes used for sore throat.

Prunus serotina, wild black cherry.

An extract and syrup made from the bark has been employed in pulmonary consumption, also as a tonic in conditions of debility.

Ptelea trifoliata, hop tree.

The leaves and young shoots were used in a strong infusion as an anthelmintic.

Pycnanthemum linifolium, mountain mint.

The herbage in infusion has been used in a variety of gastric and intestinal disorders.

Radicula Armoracia, horseradish.

The horseradish is sometimes used domestically as a stimulant in stomachic disorders.

Rumex Acetosella, sheep sorrel.

The leaves have been used externally in cancer and internally for dyspepsia, scrofula, and many chronic affections. A powder from the root has been made into a dentifrice.

Rumex crispus, curled dock.

An extract and syrup is made of the roots of dock which is sometimes employed in chronic affections, such as scrofula, dyspepsia, and obstinate skin diseases.

Sabatia angularis, rose pink.

A pure bitter and tonic with no astringency and very little aroma. It has been much used as a stomachic and has been considered as a substitute for quinine in intermittent fevers.

Sanguinaria canadensis, blood-root.

The root is the part generally used. It is an acrid, acting as a powerful emetic, and has also been used in diseases of the lungs.

Sanicula marilandica, black snakeroot.

The root is presumed to be a nervine, anodyne, and astringent. It has been used in intermittent fevers, sore throat, erysipelas, and some skin diseases.

Saponaria officinalis, Bouncing Bet.

The plant is tonic, diaphoretic, and alterative.

Saururus cernuus, lizard's tail.

The root is emollient, and is sometimes used for inflamed breasts.

Scrophularia marilandica, figwort.

The leaves and roots have been used domestically as an application for piles, ulcers, and various skin diseases, and was formerly often employed for itch. That it was highly esteemed by the ancients may be gathered from Gerarde's Herbal, in which he remarks: "that if it be hanged about the neck it keepeth a man in health."

(*To be continued*)

ASSIGNMENT OF THE CROP PROTECTION INSTITUTE PLANT FELLOWSHIP TO THE GRADUATE LABORATORY AT THE GARDEN

The Crop Protection Institute is a national organization promoted by the National Research Council, and it consists of manufacturers, practical growers, and scientific men interested in the protection of plants against disease and insect attack. The Institute has only recently come into existence, but it has already shown an active, constructive interest in its field of work. Two fellowships were then established as proposed by the preliminary announcement in "Science" for March 24, 1922, as follows:

"In order to promote original research relative to the fungicidal and insecticidal properties of sulphur and the effects of sunlight, temperature, and moisture on its action, the Crop Protection Institute expects to offer two fellowships yielding an income of $2,500 each."

In a further statement accompanying this notice it was announced: "It is expected that these two men will work in two separate places, probably in suitable state experiment stations. It is anticipated that each of the two will be employed as an additional member of the staff under the head of department concerned, and that his work will be under the supervision of the department head." It was also determined that funds for supplies would be available up to $500 for each investigator per annum. In a letter from Doctor W. C. O'Kane, Chairman of the Institute, the attention of Doctor B. M. Duggar, Physiologist to the Garden, was drawn to the proposal, as follows:

"The special committee of the Crop Protection Institute that will have supervision of this work will meet in a few days to determine the locations and to choose the investigators. It

is, of course, vitally important that the best possible men that are available should be selected. We should be very glad to know if you have any one in mind who would like to apply for the fellowship in the phytopathological phase and, if so, we should be glad to have a statement of the applicant's qualifications.

"The Institute is advised that several state universities and experiment stations will offer facilities for carrying forward the investigations if some part of them should be located at these places. We shall be glad to know if you are interested and to have any word that you may care to send."

After consultation with Dr. Moore, Director of the Garden, the facilities of the Graduate Laboratory were promptly offered, and Mr. H. C. Young, then research assistant in plant physiology and instructor in botany at the Michigan Agricultural College, was nominated for the fellowship. Mr. Young had taken work in the Graduate Laboratory during 1915-16.

At a meeting of the committee of the Institute on May 25 the Garden was selected as the location for the fungicidal aspect of the work, and Mr. Young was appointed to the fellowship, the work to be carried out under the supervision of Doctor Duggar. Mr. Young began his work shortly after July 1, and notes on the progress of these investigations will be recorded as it proceeds.

NOTES

Mr. Ira W. Clokey, of the Iowa State College, Ames, Iowa, visited the Garden recently, consulting the herbarium and library.

Mr. G. H. Pring, Horticulturist to the Garden, gave an illustrated talk on "Aquatic Plants" before the St. Louis Aquarium Society, October 10, at Eagles' Hall.

Dr. Hermann von Schrenk, Pathologist to the Garden, gave an address before the convention of the American Association of Port Authorities, at Toronto, September 15, on "Marine Borers."

Dr. C. E. Leighty, Agronomist in Charge of Eastern Wheat Investigations, Office of Cereal Investigations, Bureau of Plant Industry, U. S. Department of Agriculture, visited the Garden, October 21.

Mr. L. P. Jensen, Arboriculturist to the Garden, spoke before the St. Louis Scout Masters' Association, at the Francis Home, October 2, on "Some Interesting Facts About Trees." He also gave an illustrated lecture before the Boy Scouts of Webster Groves, at the Bristol School, October 20, his subject being "The Use of Trees and Shrubs."

Dr. B. M. Duggar, Physiologist to the Garden, attended a conference on mosaic diseases of plants at the University of Wisconsin, October 10-11. On October 10 he conducted the afternoon seminar of pathologists, discussing the topic "Some Aspects of Current Research in Mosaic Diseases," and in the evening he gave a lecture on "Micro-organisms and Environment."

Students entering upon work in the graduate laboratory for the academic year are as follows:

Rufus J. Lackland Fellows.—Mr. Arthur F. Camp, A. B. University of California, assistant in plant pathology, University of California, reappointed second year; Mr. Carl C. Epling, A. B. University of California, instructor in botany, Oregon Agricultural College; Mr. Leo Joseph Klotz, B. S. and M. S. Michigan Agricultural College, reappointed second year; Mr. Samuel George Lehman, B. S. Ohio University, M. S. North Carolina State College, assistant in botany, Ohio University, instructor in botany, North Carolina State College, assistant pathologist, North Carolina Agricultural Experiment Station; Mr. Selden Richard Warner, B. S. William and Mary College, head of John Marshall High School, Richmond, Virginia, head of biology department, Sam Houston College, Huntsville, Texas.

Jessie R. Barr Fellows.—Miss Mildred Lewis Johnson, B. S. Oregon Agricultural College, M. S. Washington University, assistant in botany, University of Oregon; Miss Grace Elizabeth Howard, A. B. and M. S. University of Washington, graduate assistant, University of Washington.

Teaching Fellows.—Mr. Lionel E. Tisdale, B. S. Alabama Polytechnic Institute, M. S. Michigan Agricultural College, assistant state pathologist, South Carolina Agricultural Experiment Station, Clemson College; Dr. Nellie Carter, B. S., M. S., D. Sc. University of Birmingham, Birmingham, England.

Teaching Fellow and Research Assistant.—Dr. Joanne Karrer Armstrong, B. S. and M. S. University of Washington, Ph. D. Washington University, reappointed third year.

Fellowship of the Crop Protection Institute.—Mr. Harry C. Young, B. S. Ohio University, M. S. North Carolina State College, research assistant in plant physiology and instructor in botany, Michigan Agricultural College.

Miss Marian Griffiths, B. S. University of Washington, assistant pathologist, Office of Cereal Investigations, U. S. Department of Agriculture, is also registered for graduate work.

STATISTICAL INFORMATION FOR SEPTEMBER, 1922

GARDEN ATTENDANCE:

Total number of visitors	18,649

PLANT ACCESSIONS:

Total number of plants and seeds received as gifts	22
Total number of plants received in exchange	2

PLANT DISTRIBUTION:

Plants distributed in exchange	19

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	23
Total number of books and pamphlets donated	27

HERBARIUM ACCESSIONS:

By Gift—

Aiken, Walter H.—*Ligusticum Porteri* Coulter & Rose from Colorado	1
Cratty, R. I.—*Acalypha neomexicana* Müell. Arg. from Arizona	1
Drushel, J. A.—Plants of New York, Alabama, and Missouri	15
Fitzpatrick, Prof. H. M.—*Eocronartium muscicola* (Fr.) Fitzp.	1
Haley, Mrs. H. M.—*Euphorbia heterophylla* (L.) from Oklahoma	2
Irish, H. C.—*Paspalum* sp. and *Echinochloa Crus-galli* (L.) Beauv. from Missouri	2
Johnson, Harry P.—*Hibiscus tiliaceus* (L.) from Florida	1
Lowater, W. R.—Fungi of Maumee Valley, Ohio	21

Sherff, Dr. Earl E.—Photograph of *Bidens* sp.....	1
Smith, Rev. E. C.—Fungi from Meadville, Pennsylvania	7
Snell, Prof. W. H.—Wood-destroying fungi.....	3
von Schrenk, Dr. Hermann—Timber-destroying fungi from Wyoming.....	3
von Schrenk, Dr. Hermann—Plants of Wyoming.....	140
Weir, Dr. J. R.—Fungi of New Zealand.....	34
Zeller, Dr. S. M.—*Poria incrassata* (B. & C.) Burt from Oregon	1
Total.....	233

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from November to April, 1:00 P. M. until sunset, from April to November, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

STAFF
OF THE MISSOURI BOTANICAL GARDEN

GEORGE T. MOORE,
Director,

BENJAMIN M. DUGGAR
Physiologist in charge of Graduate Laboratory

HERMANN VON SCHRENK
Pathologist

JESSE M. GREENMAN
Curator of Herbarium

EDWARD A. BURT
Mycologist and Librarian

EDGAR ANDERSON
Geneticist

JOANNE K. ARMSTRONG
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NELL C. HORNER
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W. C. FAIRBANK
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A. HUBER
Aquatics

J. H. KELLOGG
Herbaceous and Nursery

W. F. LANGAN
Engineer

I. LANGAN
Assistant Engineer

C. MCGOVERN
Orchids

D. MILLER
Outside Floral Display

G. NINTEMAN
Construction and Farm

J. ULRICH
Inside Floral Display

H. VALLENTINE,
Carpenter

MISSOURI BOTANICAL GARDEN BULLETIN

Vol. X NOVEMBER, 1922 No. 11

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NYMPHAEA "B. C. BERRY."

NYMPHAEA "C. E. HUTCHINGS."

Missouri Botanical Garden Bulletin

Vol. X St. Louis, Mo., November 1922 No. 9

NOCTURNAL HYBRID WATER-LILIES OF THE LATE JAMES GURNEY

The late James Gurney, for many years head gardener emeritus of the Missouri Botanical Garden and superintendent of Tower Grove Park, devoted a great deal of time and energy to improving the varieties of night-blooming water-lilies. Up to the present time none of his new hybrids have been described or distributed with the exception of *Nymphaea* "Stella Gurney" (Pring, Ann. Mo. Bot. Gard., Vol. 4, p. 1) and *N.* "Frank Trelease." In view of this fact the lilies now growing in Tower Grove Park have been carefully studied and the most notable hybrids described. Their parentage, in so far as possible, has been indicated by Mr. B. C. Berry, in charge of the collection, who was associated with Mr. Gurney during his lifetime. It is almost impossible to trace the parentage of these nocturnal hybrids, since the original stock comprised two separate species, *N. Lotus* and *N. rubra*. Mr. Gurney's hybrids were all obtained by selection, one pond having been set aside for new seedlings from which the more meritorious varieties were chosen. Naturally in such a pond a great range of varieties would result from the same seed pod, either from insect, wind, or other accidental pollination.

× NYMPHAEA "B. C. BERRY" PRING

This is a dark-flowered variety closely resembling its pistillate parent, *Nymphaea* "James Gurney, Jr." The distinguishing feature is its more robust habit in flowers and leaves. The flowers are amaranth purple becoming lighter towards the base of the sepals and petals, while the leaves are of a lighter color and the margins are more prominently toothed.

Description.—Flowers nocturnal, 8–9 inches across, amaranth purple, lighter toward the base of sepals and petals; stamens dark amaranth purple, lighter towards the base; leaves 12 inches across, orbicular, with denticulate margins, dark brownish green; seed pod small, containing very few fertile seeds.

× NYMPHAEA "C. E. HUTCHINGS" PRING

A very distinct hybrid with the same general characteristics as its pistillate parent, *N. tulipifera.* It is readily distinguishable from *N. tulipifera*, however, by the flowers, which are larger and wider open, being concave in shape.

Description.—Flowers nocturnal, 6–7 inches across or when forcibly expanded 8–9 inches, tyrian pink, lighter towards the base of sepals and petals; stamens dark tyrian pink, lighter towards the base; leaves 10–12 inches across, orbicular, sparsely denticulate, dark brownish green; seed pod small, containing very few fertile seeds.

× NYMPHAEA "H. C. HAARSTICK" PRING

A notable seedling suggestive of *N. Omarana* and conspicuous by its large well-shaped flowers and copper-colored leaves. *Nymphaea* "Mrs. D. R. Francis" is the pistillate parent.

Description.—Flowers nocturnal, 10–12 inches across, rose shading to a rose pink at the base of the sepals and petals; stamens rose color, lemon-chrome at the apex, anthers dark rose pink; leaves 14–16 inches across, orbicular, dentate, conspicuous by their unusual copper coloration.

× NYMPHAEA "J. S. WALSH" PRING

An extremely interesting hybrid derived from two parents of the lotus type, *N. Kewensis* and *N. tulipifera.* It presents the unusual floral feature of continuing its opening throughout the day, contrary to all other hybrids of the lotus group. This factor has opened up the possibility of converting future hybrids from the original night-blooming parents, *N. Lotus* and *N. rubra*, into both nocturnal and diurnal lilies. *Nymphaea* "J. S. Walsh" closely resembles *N. Kewensis*, the pistillate parent, in general habit and coloration both of leaves and flowers. The expanding of sepals and petals is entirely different from that of the rest of the group which

NYMPHAEA "H. C. HAARSTICK."

NYMPHAEA "J. S. WALSH."

NYMPHAEA "JAMES GURNEY, JR."

NYMPHAEA TULIPIFERA.

open wide the first night when the ovary is receptive. In this case the opening is gradual, it being three days before the flower is fully expanded. The first day or night the flower is cylindrical; the next day the petals begin to open wider; and on the third day the flower is entirely open, being bell-shaped, and extending below the water level in the same expanded manner, the sepals and petals never changing their position. The seed pod is very small and practically sterile. Several seed pods were examined and in each case only one or two viable seeds were to be found in the carpels.

Description.—Flowers nocturnal and diurnal, bell-shaped, 6–7 inches across or when forcibly expanded 10–12 inches, hermosa pink, fading with age; stamens dark hermosa pink, lighter towards the base; leaves 12–14 inches across, orbicular, dentate, brownish green, turning dark green with age; seed pod small, almost sterile.

× NYMPHAEA "JAMES GURNEY, JR." PRING

The flowers and leaves of this hybrid present the darkest colors of any of the night-blooming varieties. The color in both leaf and flower is solid throughout, showing no intermediate shades as do the other forms. The flowers may be distinguished from those of "B. C. Berry" by the horizontal position of the sepals and petals when fully expanded. The plant is not a robust grower and does not reproduce readily from tubers. The seed pods are very small and contain very few fertile seeds. *Nymphaea* "Frank Trelease" is the pistillate parent.

Description.—Flowers nocturnal, 7–8 inches across, amaranth purple, very striking in view of the absence of intermediate shades; sepals and petals superimposed, taking a horizontal position; stamens dark amaranth purple, lighter towards the base; leaves 10–11 inches across, orbicular, denticulate, dark reddish brown, representing the darkest leaf coloration of the lotus type; seed pods almost sterile.

× NYMPHAEA "TULIPIFERA" PRING

A seedling of unknown parentage which might be called a pygmy nocturnal variety. Its flowers are very striking, since they retain their bell shape throughout the flowering period,

never opening wider than an ordinary tulip blossom. The leaves are small, suggesting the hardy water-lily in shape. This hybrid is difficult to propagate in view of the scarcity of young tubers and partial sterility of seed pods.

Description.—Flowers nocturnal, 4 inches across or when forcibly expanded 6–7 inches, rosolane purple, lighter towards the base; stamens dark rosolane purple, much lighter at the base; leaves 8-9 inches across, orbicular, sparsely minutely denticulate, suggesting the hardy lily in shape; lobes overlapping, dark reddish brown, summit of the petiole dark green radiating with the venation; seed pod small, almost sterile.

× NYMPHAEA "EMILY GRANT HUTCHINGS" PRING

A light-flowered form of *N.* "C. E. Hutchings," which suggests *N. tulipifera* as a parent. The flowers are amaranth pink, opening full with age. The leaves are small and of a brownish green color.

JELLY FROM WILD FRUITS

In nearly every community there go to waste each year quantities of wild fruit suitable for jelly making, that might be had for the asking. Wild apples, wild plums, wild cherries, japanese quinces, hawthorns, wild grapes, cornelian cherries, barberries, and elderberries all make good jelly. Some of these can be used alone, while some are best when combined with other fruits. A mixture of wild apples and hawthorns, with a sprinkling of wild grapes, wild plums and elderberries gives a beautiful rose-purple jelly of excellent flavor.

The cultivated apple has been naturalized in many parts of the country, particularly in New England and New York, where it is commonly found along roadsides and country lanes. Landowners will usually give permission to pick the fruit, and though usually gnarled and sour, it makes excellent jelly. *Pyrus ioensis* and *Pyrus coronaria*, our native American apples, are common around St. Louis. Their small, yellow fruit is sour and somewhat astringent, yet it makes delicious jelly, particularly when used in combination with the large-fruited hawthorns.

WILD FRUITS.
(Japanese quince, grapes, and apples.)

JELLY FROM WILD FRUITS.
(The addition of a few wild grapes has colored the darker jelly.)

The common elderberry, *Sambucus canadensis*, with its broad panicles of white flowers followed by deep purple fruit, is a familiar sight in eastern North America, and the fruit is commonly used in small quantities for wine and pie making. Combined with wild plums and wild apples it makes delicious jelly, while the addition of a few heads of elderberries will give crabapple jelly a beautiful rose-purple color without appreciably changing the flavor.

Most of the native plums make good jam and jelly. Several of the better forms have been introduced into cultivation and are the more valuable since they will succeed in regions where no other fruit will grow. The common barberry, now outlawed in the West because of its relation to the wheat rust, is still cultivated in many parts of the country and has run wild in the East. In combination with other fruits it gives a good color and flavor to jellies, and when used alone it produces a clear red jelly quite like that made from red currants.

The several species of wild grapes native to North America are excellent for jelly making, some of them being superior to the cultivated ones in this respect. Though they are not as often neglected as many of the other wild fruits, large quantities go to waste every year, even in thickly settled regions. Good grape juice can be made from the juicier kinds, but it is apt to have a "stemmy" taste and seldom equals that made from the cultivated varieties. Fence-rows, river-banks, and the edges of wood lots are likely places to find the vines.

Many different species of hawthorns are found in Missouri, and in late years some of the more handsome forms have been planted for the beauty of their white flowers and red fruit. The fruit varies in size in the different species from smaller than a pea to that of small plums. Those with bright red, medium-sized, sub-acid fruit (*Crataegus mollis* and allied species) are the best for jelly. In cooking they lose the unpleasant flat taste so characteristic of hawthorns and the jelly is much like that of crabapples.

Each year the common rum cherry *(Prunus serotina)* produces large quantities of red-purple fruit which is seldom

used, although in combination with wild apples it makes a delicious dark red jelly, semi-opaque, resembling plum jelly in consistency and flavor.

None of these fruits require any special treatment. After a thorough washing they should be covered with water, the juicier fruits requiring less water, and boiled until soft. The juice is then strained through a jelly bag, and if the resulting pomace has not lost all its flavor more water may be added and the process repeated. (Crabapples can be cooked up in this way four or five times, though the later boilings sometimes produce a cloudy jelly.) The juice should be measured, and an equal weight of sugar added after the juice has boiled for ten to fifteen minutes. Tests should be frequently made for jelling by trying a small amount on a cold plate or by noticing the way in which it drips off a spoon.

The cornelian cherry *(Cornus Mas)*, an ornamental dogwood notable for its misty yellow flowers which appear before the leaves in early spring, is often planted about residences. During the summer it bears a crop of beautiful red-purple, plum-like fruits, unpleasant to the taste, but making excellent jam and jelly.

The japanese quince *(Cydonia japonica)*, a low, prickly shrub grown for its bright ornamental flowers, bears nearly every year a crop of gnarled, yellowish-green, aromatic fruits, hard, sour and "puckery," but unexcelled for jelly making. The juice "jells" readily and so may well be used in combination with hawthorns, sweet apples, and similar fruits. The fruit is so acid that even though the pomace has been boiled up three or four times it still has enough flavor to make excellent fruit-butter. In making this the pomace should be forced through a fine sieve, cinnamon and ground cloves added, and the mixture cooked slowly—all day if possible, using an asbestos mat to prevent burning. When it is nearly done sugar should be added, the amount varying greatly with the condition of the fruit, and then boiled for five minutes more.

MEDICINAL PLANTS OF OUR LOCAL FLORA

(Continued from October Bulletin)

I. HERBACEOUS PLANTS

Scrophularia nodosa, Maryland figwort.

This plant was formerly employed as an alterative in gout and rheumatism.

Scutellaria lateriflora, skullcap.

At one time this plant had quite a reputation as a remedy for hydrophobia, although now it is not supposed to have had any efficacy in this malady.

Senecio aureus, golden ragwort.

This plant is said to be diaphoretic, diuretic, and tonic.

Silphium laciniatum, compass plant.

Silphium perfoliatum, cup-plant.

These plants afford a fragrant bitter gum which is supposed to act as a stimulant and antispasmodic.

Smilax herbacea, carrion flower.

The roots of the carrion flower have been employed as a dissolvent of tumors, and it is said that the negroes of South Carolina used it in combination with molasses and Indian corn in the manufacture of a very pleasant beer.

Solanum Dulcamara, bitter-sweet.

A decoction made from the young twigs of this plant has been employed in chronic rheumatism, asthma, chronic catarrh, and in those conditions of the system in which sarsaparilla has been found beneficial.

Solanum nigrum, common nightshade.

The plant is said to be narcotic, diuretic, and diaphoretic. It has been used as a remedy in chronic catarrh, but its reputation has arisen mainly from the benefit obtained from its use in obstinate skin diseases.

Stellaria media, chickweed.

The plant is refrigerant, demulcent, and alterative.

Tanacetum vulgare, tansy.

The leaves and flowers formerly were in high repute in domestic practice in the treatment of dyspepsia, hysteria, and intermittent fevers, but they are rarely employed by the physician.

Taraxacum officinale, dandelion.

The part used for medicinal purposes is the root which has been employed in deranged conditions of the digestive organs when combined with a deranged condition of the liver, also in affections of the spleen. The leaves of the dandelion are much used in the spring as a salad.

Tradescantia virginiana, spiderwort.

A preparation from the root used in solution is said to soothe and protect irritated mucous membranes and other tissues.

Trifolium pratense, red clover.

Trifolium repens, white clover.

Clover has been used in an ointment for ulcers and cancers, and a decoction of the plant is sometimes taken internally.

Trillium erectum, wake-robin.

The rhizomes and rootlets of this plant are supposed to be astringent, tonic, and alterative, and were much used by the Indians. They have been employed in various hemorrhagic discharges and as a catapasm to ill-conditioned tumors.

Triosteum perfoliatum, horse gentian.

The root is a mild cathartic and sometimes acts as an emetic.

Verbascum Thapsus, mullein.

This plant is demulcent, diuretic, and anodyne. It has been used in aphonia and asthma, and a decoction of the leaves in diarrhea.

Verbena hastata, blue vervain.

The plant has been used as an emetic and a tonic, also as a counter-irritant in ivy poisoning.

Veronica virginica, Culver's root.

The rhizome and rootlets when fresh act as a violent emeto-cathartic which is sometimes used in disorders of the digestive system, but is too violent to be prescribed with safety.

Viola tricolor, pansy.

The fresh plant or its juice has been used as an external application in chronic diseases of the skin.

II. WOODY PLANTS

Acer Negundo, box elder.

The bark is bitter, astringent, and tonic.

Aesculus glabra, Ohio buckeye.

The bark is tonic and astringent and has been used successfully in fevers as a substitute for quinine.

Ampelopsis quinquefolia, Virginia creeper.

The bark and twigs are astringent, tonic, alterative, and expectorant.

Asimina triloba, pawpaw.

The juice of the pawpaw has been used as a vermifuge.

Betula nigra, black birch.

The bark and leaves in decoction have been considered blood purifiers and have been employed domestically for rheumatism, gout, and affections of the skin.

Catalpa bignonioides, Indian bean.

The bark and seeds are said to act as an emetic, vermifuge, and anodyne. A tincture made from the seed and pods has been used in bronchitis and asthma.

Ceanothus americanus, New Jersey tea.

Both the leaves and roots contain a considerable percentage of tannin and have been used as an astringent.

Cephalanthus occidentalis, button-bush.

The bark has been employed in intermittent fevers. The inner bark of the root is an agreeable bitter and was frequently used as a remedy in obstinate coughs.

Cornus florida, flowering dogwood.

Cornus alternifolia, dogwood.

The bark of the dogwood is tonic, astringent, and slightly aromatic. It was used in early days in fevers as a substitute for quinine, also as a tonic in convalescence, loss of appetite, and in debility of the digestive organs.

Crataegus, local species of hawthorns.

The fruit has been used in affections of the heart.

Evonymus atropurpureus, burning bush.

The bark has been used domestically as an emetic and also appears to possess some narcotic properties. The seeds are purgative and emetic.

Fraxinus americana, white ash.

The bark is bitter and astringent, and before the introduction of quinine was much used in the treatment of intermittent fevers. The leaves are purgative, while the seeds are diuretic and used in cases of obesity.

Gleditsia triacanthos, honey locust.

The sap is saccharine and sometimes used as a tonic.

Gymnocladus canadensis, Kentucky coffee tree.

The pod and seeds are emetic and nervine, while the leaves are cathartic.

Hydrangea arborescens, wild hydrangea.

The roots have been used as a dissolvent of bladder stones, and the leaves as a tonic and purgative.

Juglans cinerea, butternut.

The inner bark, especially of the root, is used in extract or decoction for the treatment of dysentery. It is also a pleasant and mild cathartic somewhat of the character of rhubarb.

Juglans nigra, black walnut.

The black walnut has an acrid bark which is sometimes used for tinctorial purposes.

Juniperus virginiana, red cedar.

An oil is made from the red cedar which has been used in domes-

tic practice for elimination of intestinal worms, to produce perspiration, and as a tonic.

Menispermum canadense, moonseed.

The rhizome and rootlets are said to have been used in rheumatic, scrophulous, and mercurial diseases.

Platanus occidentalis, sycamore.

The leaves are ophthalmic and the bark antiscorbutic.

Quercus alba, white oak.

A decoction of the bark has been employed as an astringent in diseases of the bowels and in hemorrhages, as a bath in diseases of children, and as a gargle for sore throat. A poultice of the ground bark has been employed in gangrene and as an application for ulcers. Other local oaks afford a similar bark which has been used as a substitute.

Rhus aromatica, fragrant sumac.

The bark and leaves are tonic, astringent, and antiseptic. The fruit is diuretic, refrigerant, acid, and febrifuge, and has been used domestically in fevers and inflammatory affections and as a gargle for sore throat.

Rhus glabra, smooth sumac.

The berries are astringent, their acidity being due to the presence of malic acid. An infusion of them has been recommended as a cooling drink in fevers and as a gargle in affections of the throat.

Rhus Toxicodendron, poison ivy.

The juice of this plant is yellowish and milky when fresh, but becomes black on exposure to the air. It has been used in rheumatism, diseases of the skin, paralysis, and some affections of the eyes. Its good effect, however, does not counterbalance the risk of poisoning, and it is at present seldom or never used.

Robinia Pseudo-Acacia, black locust.

The bark is said to be tonic and cathartic, the leaves emetic, and the flowers mildly narcotic.

Rubus occidentalis, blackberry.

The blackberry contains tannin as its chief and most important constituent. It is used as a mild astringent, chiefly in diarrhea of young children.

Salix nigra, black willow.

Willow bark is tonic and antiperiodic. It has been used in intermittent fevers and as a tonic in dyspepsia, debility, and convalescence. Recently salicin has been employed in rheumatism.

Sambucus canadensis, common elder.

The inner bark of the elder was used by the ancients in the treatment of dropsy, and it is sometimes still used for that malady in domestic practice. Its action as an emetic and purgative is, how-

ever, so violent that sometimes inflammation of the bowels occurs. The leaves and young buds are also purgative. The flowers are used in the preparation of elder-flower ointment which is employed as a cooling and soothing application for ulcers and burns. The berries furnish a juice which when diluted with water is a cooling drink in fevers, and wine made from them is an excellent cordial.

Sassafras officinale, sassafras.

The pith when placed in water affords a clear mucilage of a peculiar character, not being affected by alcohol. This mucilage is used as an application for inflammed eyes and is very soothing. It has also been used in disorders of the respiratory organs, bowels and bladder. The bark is used in combination with other substances in rheumatism.

Tilia americana, American linden.

An infusion of the flowers, buds and leaves is used domestically as a remedy in cases of indigestion and nervousness.

Ulmus fulva, slippery elm.

An infusion of the inner bark is used in acute inflammatory or febrile affections, either alone or with lemon juice. Externally it is often employed in the form of a poultice.

Viburnum prunifolium, black haw.

The bark of the black haw is said to be antispasmodic, astringent, nervine, and tonic.

Zanthoxylum americanum, prickly ash.

The whole plant is endowed with active properties. The leaves and fruit abound in a volatile oil, which is very fragrant, and the bark is acrid, pungent, and aromatic. It is an active stimulant, causing more or less general excitement, with a tendency to perspiration. It has been much used in domestic practice in the treatment of chronic rheumatism. It is also used as a relief of flatulency and colic, and externally as an application for ulcers and as a relief for toothache.

NOTES

Mr. G. H. Pring, Horticulturist to the Garden, was appointed superintendent of the St. Louis Flower Show held at the Coliseum, November 7-12.

Recent visitors to the Garden include Prof. Teizo Niwa, professor of horticulture, Mie Imperial College of Agriculture, expert in Shinjiku Imperial Garden, Tokyo, Japan.

Volume IX, No. 2, of the Annals of the Missouri Botanical Garden, containing "Monograph of the Isoetaceae," by Dr. Norma E. Pfeiffer, has recently been issued.

Dr. D. T. MacDougal, Director Botanical Research of the Carnegie Institution of Washington, Tucson, Arizona, visited the Garden, November 19, and presented a paper at the graduate seminar on "Some Experiments on Permeability with a New Osmotic Cell."

The first meeting of the St. Louis American Library Association, local chapter, was held at the administration building of the Garden, November 22. Dr. George T. Moore, Director of the Garden, discussed the Garden library and some of its more unusual and rare books.

The silver medal, offered by the Society of American Florists and Ornamental Horticulturists at the recent St. Louis Flower Show, was awarded to Mr. G. H. Pring, Horticulturist to the Garden, for originating the first hybrid white day-blooming water-lily, *Nymphaea* "Mrs. G. H. Pring."

STATISTICAL INFORMATION FOR OCTOBER, 1922

GARDEN ATTENDANCE:

Total number of visitors	25,105

PLANT ACCESSIONS:

Total number of plants and seeds received as gifts	26
Total number of plants received in exchange	65
Total number of seed packets received in exchange	9

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	17
Total number of books and pamphlets donated	134

HERBARIUM ACCESSIONS:

By Gift—

Anderson, A.—*Marchantia polymorpha* L. from Missouri	1
Drushel, J. A.—Plants of Vermont, Ohio, and Missouri	21
Greenman, J. M.—*Pluteus cervinus* Schaeff. from Illinois	1
Koch, Max—*Encephalartos Fraseri* Miq. from Australia	1
Latham, R.—*Poria* sp. from New York	1
McWhorter, Prof. F. P.—*Ephelis pallida* Pat. from the Philippine Islands	1
Overholts, Prof. L. O.—Fungi from Pennsylvania	4
Overholts, Prof. L. O.—*Corticium effuscatum* C. & E.	1
Pring, George H.—Specimen of a new hybrid water-lily "Mrs. G. H. Pring"	1

von Schrenk, Hermann—*Acer campestre* L. var. *mollis* Opiz from Webster Groves, Missouri	3
Stevens, Prof. F. L.—*Scorias spongiosa* from Indiana	1
By Purchase—	
Brandegee, T. S.—Plants of Mexico, collected by C. A. Purpus in 1922	143
Dusen, Dr. P.—Plants of Brazil	500
Weigel, Theo. Oswald—Plants of the Nyassa Mountains, Africa	405
By Exchange—	
U. S. Department of Agriculture, by Prof. A. S. Hitchcock—Grasses of British Guiana	109
U. S. Department of Agriculture, by Prof. A. S. Hitchcock—Grasses of Hawaiian Islands	77
Total	1,270

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from November to April, 1:00 P. M. until sunset, from April to November, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

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Missouri Botanical Garden Bulletin

Vol. X DECEMBER, 1922 No. 10

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SILVER MEDAL AWARDED BY SOCIETY OF AMERICAN FLORISTS AND ORNAMENTAL HORTICULTURISTS TO MR. G. H. PRING, HORTICULTURIST TO THE GARDEN, FOR ORIGINATING THE FIRST HYBRID WHITE DAY-BLOOMING WATER LILY, NYMPHAEA "MRS. G. H. PRING."

Missouri Botanical Garden Bulletin

Vol. X St. Louis, Mo., December 1922 No. 10

PAULOWNIA TOMENTOSA

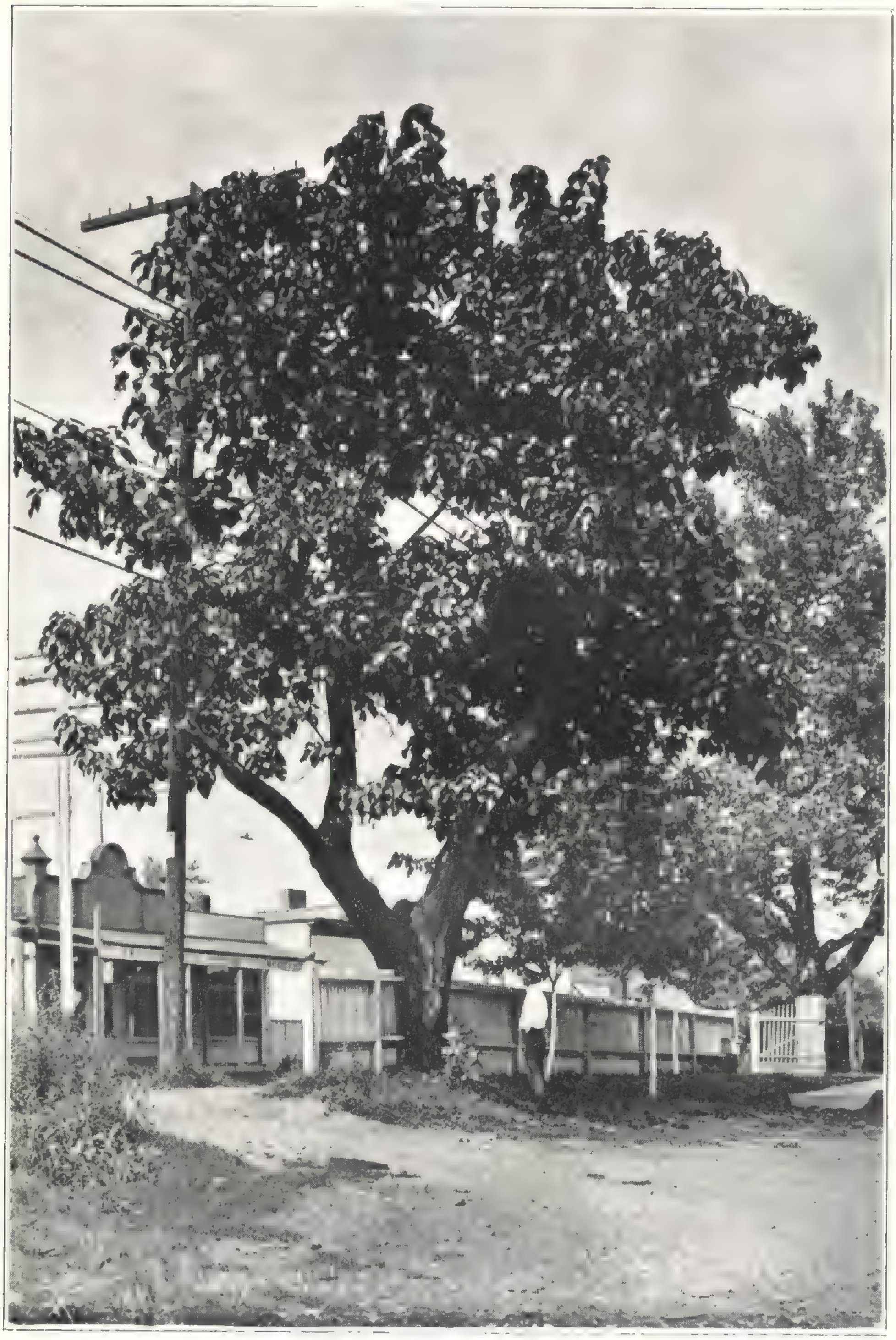
An unusually large specimen of the so-called imperial tree of China may be found in the garden of Mrs. A. Bohnn, 9406 Broadway, of this city. The local specimen is interesting because of its having withstood the winters of this region long enough to attain the maximum size, comparing most favorably with the trees of the same species growing in subtropical regions. According to Mrs. Bohnn, the tree was planted by her father-in-law, over fifty years ago, from seeds sent him from the southern states. The tree is growing adjacent to the public sidewalk on Broadway, dividing the property fence by its large trunk. It is fully 40 feet in height, with a spread of approximately 35 feet, and a trunk diameter of 3 feet. Within the last few years the prevalent storms have damaged two of the largest branches, necessitating pruning back to the main stem. The tree has flowered annually during April or May, and at the present time bears many large panicles of fruit suggesting the common buckeye in appearance. Each seed-pod contains hundreds of small seeds which are provided with a small circular winged appendage for the purpose of wind dissemination, and a number of young plants ranging from 6 to 20 feet in height are growing directly across the street, evidently having been established in this way.

Paulownia is fairly hardy as far north as New York, but it is a rare occurrence to find trees of the size of the local specimen outside of California or Florida. It is, however, grown as an ornamental foliage plant much farther north, but is killed to the ground every winter. In China and Japan it is cultivated for its ornamental flowers and fruit, and in the southern part of the United States it has been used as a street tree. It is frequently mistaken for the catalpa because of its similar habit and foliage.

Commercial Use.—The wood of Paulownia is fairly light

and soft. It is easily worked, and because of this fact is in great demand in Japan for various purposes, its chief use being in the manufacture of veneer. This industry, confined to Yamagata City in northern Japan, embraces ten establishments employing over three hundred people. In 1920, seven million sheets of veneer, each two by three feet, were manufactured, worth from one to three cents a sheet, depending upon the quality. Its principal use is in the domestic trade for surfacing decorative boxes and fancy containers, but very little has been exported to the United States.

For the manufacture of veneer the trees are cut in winter, the logs being stored in cellars to prevent drying out. They are subsequently cut up into bolts two to three feet long and split into quarters, all bark and defective wood being removed. A quarter is then placed in a clamp and in this position it is ready for the planing operation along the split end. The veneers are merely shavings made by hand with a big plane similar to that used by an American carpenter, only much larger, the blade being about six inches wide. A long bamboo spring pole may be used to supply an even pressure, the workman simply guiding the plane backwards and forwards over the block. Fifty or sixty of the shavings are bundled together, these bundles then being boiled for approximately twenty minutes in dilute caustic soda after which they are immersed for a few minutes in dilute bleaching solution and washed in fresh water. To neutralize any alkali and to further prevent discoloration, they are thoroughly wetted with acid water at the rate of one part sulphuric acid to a thousand parts of water. While still wet the shavings are spread upon a smooth lacquered glass board, the edges being lapped slightly to make up a panel. The water is wiped off and paper backing applied by means of glue. The sheets are then hung up to dry and later smoothed with a hot iron. Frequently fancy-figured paper in color is used for a backing, which because of the transparency of the silvery wood tissue, produces an effect much in demand. In Japan this product is called Kiri-gami (paulownia paper), or when placed on the market it may appear under the name Kiri-kyogi-gami (paulownia veneer paper).



PAULOWNIA TOMENTOSA.

Description.—Named in honor of Anna Paulownia, princess of the Netherlands. Native of Central China. Tree 40 feet high, with stout spreading branches forming a round or ovate head; leaves large, especially when annually pruned to the ground, broadly cordate-ovate, entire or occasionally 3-lobed, acuminate, pubescent above, tomentose beneath, 8–10 inches long, upon long petioles; panicles 1 foot long; flowers fragrant, pale violet, 1–2 inches long, suggesting somewhat a foxglove or gloxinia in shape; pedicels and calyx densely rusty tomentose; calyx lobes short, rounded; seed-pod resembling a buckeye in shape, containing a large number of orbicular winged seeds.

PLANT PRODUCTS IN INDUSTRY

In this, the so-called age of industry, we fail to realize how large a part plant products play in our daily lives, and are inclined to overemphasize the importance of the brick and steel with which we are surrounded. The chemist and the engineer command universal respect because their part in the development of civilization is well known, but the no less important contributions of the botanist and the plant breeder are often overlooked.

To bring the importance of plant products forcibly to the attention of his students, Prof. Oakes Ames, of Harvard University, asked them to take a census of the advertising they saw. Such a census usually revealed the fact that an overwhelming majority of the commodities advertised were plant products. That this is also true in St. Louis may be shown from the following census taken recently of 123 billboard and street-car advertisements selected at random:

Plant products	88
Animal products	8
Mineral products	5
Personal services (banks, schools, etc.)	22

The plant products were distributed as follows:

Food	21	Beverages	6
Soap	13	Clothing	6
Narcotics	11	Chewing gum	6
Furniture	7	Misc.	12
Rubber	6		

It is true that some of the commodities classified under plant products are made partly from animal and mineral products, but this is more than counterbalanced by the incidental plant products included under the animal and mineral classification. Our soaps are made from both animal and vegetable oils, but the latter play an important part, especially in the better grades. The chief vegetable oils used in soaps are those from the common cocoanut palm *(Cocos nucifera)*, the oil palm *(Elaeis guineensis)*, and the olive *(Olea europaea)*. Our common food plants are so well known as hardly to deserve mention. It may not be generally known, however, that macaroni is made from the glutinous flour of the hard or flint wheat *(Triticum durum)*. Our rubber to-day comes from a number of plants, the most important being *Hevea brasiliensis*, the juice of which becomes Para rubber. The common rubber tree of houses and conservatories, *Ficus elastica*, produces a relatively unimportant product known to the trade as Indian rubber. The chief ingredient of chewing gum is the coagulated juice of a Central American tree *(Achras Sapota)*. This coagulated juice, or chicle as it is usually called, is also used in the making of statuettes. Living specimens of the oil palm, the olive, the cocoanut palm, the Para rubber tree, and the chicle tree may be seen at the Garden.

TWIGS AS WEATHER RECORDERS

Every tree is in a sense an automatic weather-recording instrument. Nearly every one has heard of the growth rings by means of which the age of a tree may be estimated and the growth of different seasons compared, but it is less commonly known that many trees have scars left by bud scales on their smaller branches showing where growth started each spring. These disappear as the branch enlarges, but it is not at all unusual to find the complete records for the previous ten to fifteen years.

The amount of growth is determined by many factors, internal and external, but a series of measurements recently made upon the silver maple trees of the Garden shows that climatic conditions have a surprisingly great effect. The annual growth in length for 1919-1922 was measured on ten

silver maple trees. Four to seven twigs were measured on each tree, only healthy unbroken ones being used. As might have been expected, different twigs on the same tree showed about the same proportions of growth for the four years. The following data are typical:

GROWTH OF SILVER MAPLE TREES FOR 1919-1922
(in inches)

1919	1920	1921	1922
11	9.5	6.5	6
6.5	8.5	5.5	3.5
7.5	8.0	6.0	4.0
11	8.0	8.0	3.5
9.5	12.0	9.5	8.5

More surprising, however, is the fact that all the trees showed practically the same proportions of growth for the four years. In spite of the fact that some were small and some large and that they came from the most diverse situations, all but one showed the greatest growth in 1920. To make the data directly comparable the year in which the tree made the greatest growth is recorded in the following table as 1, the second greatest as 2, etc.:

COMPARATIVE GROWTH OF TEN SILVER MAPLE TREES

Tree No	1	2	3	4	5	6	7	8	9	10
1919.....	2	2	2	2	2	2	2	4	1	2
1920.....	1	1	1	1	1	1	1	1	2	1
1921.....	3	4	4	4	3	3	4	3	3	3
1922.....	4	3	3	3	4	4	3	2	4	4

The following figures from a few trees in Webster Groves show that the same general conditions prevailed over a fairly large area:

COMPARATIVE GROWTH OF SOME WEBSTER GROVES TREES FOR 1919-1922

Tree No.	1	2	3	4
1919.....	2	1	1	1
1920.....	1	2	2	2
1921.....	3	3	4	4
1922.....	4	4	3	3

A few measurements on Norway maples and sweet gums gave similar results:

COMPARATIVE GROWTH OF NORWAY MAPLES AND SWEET GUMS FOR 1919-1922

	Norway Maples				Sweet Gums	
Tree No.	1	2	3	4	1	2
1919.....	3	2	2	4	2	2
1920.....	1	1	1	1	1	1
1921.....	4	3	3	3	4	3
1922.....	2	4	4	2	3	4

Since climate was the only factor which could have had a similar influence on all of these trees we may conclude that 1919 and 1920 were good growing seasons and that 1921 and 1922 were much less favorable. Inasmuch as silver maples make most of their growth during a relatively short period in the spring, we have here an index to the weather of that season during the last four years. If we knew more about the requirements of the different species of trees we would be able, by studying their twigs, to determine the weather most favorable for growth over a long period of years.

PLANTS OF VERY LIMITED LOCAL DISTRIBUTION

The following plants, most of which have a wide general distribution, are confined to very limited areas within our local territory. For this reason they are particularly interesting to the student of local plants and are deserving of propagation and protection.

TREES AND SHRUBS

Acer rubrum var. *tridens*.

A variety of the red maple represented by a few trees near Allenton. This variety can be distinguished from the species by the leaves, which are small, obovate, narrowed or rounded, and subentire or sparingly toothed below the three short lobes, the middle lobe being broadly triangular. General distribution: Mass. to Fla., Mo., and Tex.

Ascyrum hypericoides, St. Andrew's cross.

This is the smallest of our native shrubs, its maximum height not exceeding eight inches. It is found scattered on the sand hills near Allenton and Pacific. Distribution: Mass. to S. Ill., Nebr., and southward.

Carya microcarpa, small-fruited hickory.

Bark more or less shaggy, often as rough as in the shagbark hickory *(Carya alba)*; fruit subglobose, husk often glossy, splitting nearly to the base; nut mostly gray or whitish, angled, rather thin-shelled for the group. This is the most variable of all hickories. One tree has been found near Allenton and one near Clayton. Distribution: Mass. to Mich., south to Va., Ill., and Mo.

Cornus alternifolia, alternate-leaved dogwood.

A shrub or small tree 6–18 feet high, with alternate oval or ovate leaves; twigs green streaked with white; loose cymes of white flowers in May and June followed by deep blue fruit on reddish stalks. Abundant near Allenton but nowhere else in our locality. Distribution: Quebec to W. Ont., Minn. and Ia., south to Ga. and Ala.

Crataegus, hawthorn.

Our local flora comprises 38 species of Crataegus, and of these 24 are strictly confined to this territory, some being represented by one or a very few plants. *Crataegus Margaretta* is found only along the upper River des Peres basin.

Quercus alba X *stellata*, hybrid oak.

This tree is growing near Allenton. It has the fruit of the post oak *(Quercus stellata)*, and the leaves are a shape intermediate between the two parents. Only one tree has been found.

Quercus lyrata, swamp post oak.

This species is represented by a very few trees at Allenton, Distribution: N. J. to Ind., Mo., Fla., and Tex.

Ribes Cynosbati, prickly gooseberry.

Found scattered on the limestone bluffs from Pacific to Allenton. It may be distinguished from the more common *Ribes gracile* by its prickly fruit and by the fact that it always grows on bluffs. Distribution: Me. to Manitoba and south to Mo.

HERBACEOUS PLANTS

Agrostis arachnoides, Elliott's bent-grass.

Found scattered on the sand hills near Pacific. Distribution: S. C. to Ky. and Mo., south to Fla. and Tex.

Aplectrum hyemale, Adam-and-Eve.

This interesting orchid is still to be found near Creve Coeur Lake, but even there it is very scarce. Distribution: Ont. and Ore., south to Ga., Mo., and Cal.

Arabis lyrata, lyre-leaved rock-cress.

This low, tufted perennial is rather plentiful on the sand hills at Batrock, near Pacific, but is found nowhere else in this locality. Distribution: Ont. to Va. and Ky., west to Manitoba and Mo., also in Japan.

Aralia nudicaulis, wild sarsaparilla.

A few colonies are found growing on the sand bluffs near Pacific. Distribution: Newfoundland to Ga., Colo., and Idaho.

Aristida basiramea, forked aristida.
This grass is abundant on dry hills near Allenton and Pacific. Distribution: Ill. to Manitoba, south to Va. and Kan.

Asplenium Trichomanes, maidenhair spleenwort.
This beautiful little fern is abundant along the lower hill slopes near Pacific and Allenton. Distribution: Throughout nearly the whole of North America except the extreme north; also in Europe, Asia, and Africa.

Aster furcatus, forking aster.
A few clumps of this white aster are to be found on the banks of the Meramec River near Allenton. Distribution: Ill. and Mo.

Boltonia decurrens, clasping-leaved boltonia.
Plentiful along the lake shores of the American Bottoms. It is distinguished by its winged stems and violet or purple inflorescence. Distribution: Ill. and Mo.

Brasenia Schreberi, water shield.
Abundant in a pond near Eureka, its only local station. Distribution: Asia, Africa, and Australia.

Cabomba caroliniana, Carolina water-shield.
Found at two stations within this locality, one at Creve Coeur Lake, the other in ponds near Allenton. Distribution: S. Ill. to N. C., south to Fla. and Tex.

Clematis Fremontii, Fremont's clematis.
Growing abundantly on glades near Allenton and Pacific. Distribution: Prairies, Kan. and Mo.

Corallorhiza odontorhiza, small-flowered coral-root.
One large colony on the hillsides near Bluff Lake, Ill. Distribution: Mass. to Mich., Fla., and Mo.

Diarrhena diandra, diarrhena.
This grass is to be found scattered in the rich woods at Allenton, Pacific, and along the Illinois bluffs. Distribution: Ohio to Kan., south to Ga., Tenn., and Okla.

Dicentra canadensis, squirrel corn.
In rich woods near Pacific where it is very abundant. Distribution: Nova Scotia to Minn., south to Va. and Ky., west to Mo.

Echinodorus tenellus, dwarf water plantain.
Scattered colonies growing along the shores of Bluff Lake, Ill. Distribution: Mass. to W. Ont. and Minn., south to Fla., Mo., and Tex.

Heracleum lanatum, cow parsnip.
This tall stout perennial is plentiful along Creve Coeur Lake, the only local station. Distribution: Newfoundland to the Pacific and southward to N. C., Ky., and Kan.

Lycopodium lucidulum, shining club moss.

A very small colony is persisting among the sand rocks at Batrock near Pacific. Distribution: Newfoundland to B. C., south to N. C. and Va.

Mitella diphylla, bishop's cap.

Abundant on the sand bluffs near Pacific. Distribution: Quebec to N. C., west to Minn., Ia., and Tex.

Osmunda cinnamomea, cinnamon fern.

Only a few colonies of this fern are now found on the lower hillsides near Pacific. Distribution: Nova Scotia to Minn., south to Fla. and Mexico.

Peltandra virginica, green arrow arum.

A few scattered colonies in Bluff Lake, Ill. Distribution: Me. and Ont. to Mich., south to Fla. and La.

Phacelia bipinnatifida, loose-flowered phacelia.

Rather plentiful on the hillsides near Bluff Lake, Ill., the other nearest-known station being on the Gasconade River, near Jerome, Mo. Distribution: Ohio to Ill., south to Ala.

Polymnia uvedalia, leaf-cup.

Plentiful at Creve Coeur Lake, and a colony of a few plants are near Allenton. Distribution: N. Y. to Mo. and south.

Polypodium vulgare, common polypody.

Found only at Batrock, near Pacific, growing among the sand rocks. Distribution: Almost throughout North America, Asia, and Europe.

Rudbeckia subtomentosa, sweet cone-flower.

A very small colony of this plant is growing in the swamps just south of the Meramec River near Ten Brook. Distribution: Ill. to La., Mo., and Tex.

Saxifraga Forbesii, Forbes' saxifrage.

Abundant in the sand rocks near Allenton and Pacific.

Selaginella apus, creeping selaginella.

This low, prostrate or creeping plant is found growing in scattered colonies in the sand country along the Meramec, near Pacific. Distribution: Me. and Ont. to the N. W. Terr., south to Fla. and Tex.

Solidago Gattingeri, Gattinger's golden-rod.

Found very rarely on the glades near Allenton and Pacific. Distribution: Tenn. and Mo.

Veratrum Woodii, American white hellebore.

Rather plentiful on the limestone hillsides near Allenton. As far as known, there are only two other localities in the state where this plant is found—one on Swan Creek, near Swan, and one on the Big River, near Irondale. Distribution: Quebec to Alaska, south to Ga. and Tenn., Minn., and B. C.

NOTES

The orchid show is now being assembled in the floral display house. As last year, it is being arranged to represent a South American forest.

The December 8 number of the Southern Florist contains a reprint of the article on "Hybrid Nymphaeas" from the October BULLETIN.

Dr. Hermann von Schrenk, Pathologist to the Garden, has been appointed consulting member of the Central Committee on Lumber Standards recently brought about by the Secretary of Commerce and Labor.

Mr. G. H. Pring, Horticulturist to the Garden, has been elected first vice-president of the St. Louis Association of Gardeners, and Mr. C. McGovern, in charge of outside floral displays, has been elected second vice-president.

The chrysanthemums used in the November floral display were distributed after the show to the local hospitals by the Book and Flower Guild. Some of the flowers were also used in the making of about 2000 boutonnieres for the Saturday and Sunday Hospital collections.

STATISTICAL INFORMATION FOR NOVEMBER, 1922

GARDEN ATTENDANCE:

Total number of visitors..... 88,527

PLANT ACCESSIONS:

Total number of plants received as gifts..... 16
Total number of plants received in exchange..... 9

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought..... 15
Total number of books and pamphlets donated..... 92

HERBARIUM ACCESSIONS:

By Gift—

Anderson, E.—*Entodon compressus* C. Müll. from Missouri 1

Buchholz, Prof. John T.—*Aristolochia tomentosa* Sims, *Callicarpa americana* L., from Arkansas..... 2

Charlton, O. C.—*Quercus Schneckii* Britton from Texas.. 4

Davis, Prof. W. H.—*Tremellodendron merismatoides* (Schw.) Burt from Massachusetts..... 1

Dodge, Dr. C. W.—Fungi of Massachusetts..... 10

Drushel, J. A.—Plants of Vermont, New York, Alabama, and Missouri..... 20

Kellogg, John—Medicinal plants, cultivated at The Missouri Botanical Garden..... 34

Kew Herbarium, by Mr. A. W. Hill.—Photographs of *Mimulus* types..... 3

Lowater, W. R.—*Clavariae* of Maumee Valley, Ohio..... 51

Murrill, Dr. W. A.—Fungus from Cuba..... 1

Overholts, Dr. L. O.—Fungi of Pennsylvania..... 2

Schmitz, Dr. H.—*Exobasidium Vaccinii* from Idaho..... 1

By Purchase—

Davis, Rev. John—Plants of southeastern United States, chiefly from the Piedmont region of South Carolina... 800

Total..... 930

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from November to April, 1:00 P. M. until sunset, from April to November, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

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